FLORA OF THE USSR

Volume XXV

COMPOSITAE

Tribes Eupatorieae, Astereae, Inuleae, Ambrosieae, Heliantheae and Helenieae

FLORA OF THE USSR

Initiated under the supervision and chief editorship
of Academician V.L. Komarov

VOLUME XXV

COMPOSITAE

Tribes Eupatorieae, Astereae, Inuleae, Ambrosieae, Heliantheae and Helenieae

Volume Editor
B.K. SCHISCHKIN

General Scientific Editors
Stanwyn G. Shetler
Galina N. Fet

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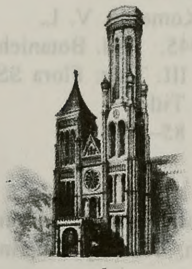

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Contributors

A.G. Borissova, V.P. Botschantzev, I.T. Vassilczenko, V.F. Golubkova, S.G. Gorschkova, V.I. Grubov, M.E. Kirpicznikov, L.A. Smoljaninova, S.G. Tamamschjan, N.N. Tzvelev, N.L. Tsvetkova, S.V. Juzepczuk

SCIENTIFIC EDITOR'S PREFACE TO VOLUME XXV

The last six volumes of the Flora of the USSR, Volumes XXV–XXX, are devoted entirely to the treatment of the Compositae (Asteraceae). Volume XXV has been reviewed in special detail, because it is the first of the six volumes on this family and includes extensive introductory text; every page of the translation has been compared with the original Russian text. This is a huge family within the boundaries of the Flora region, the former Soviet Union, including numerous genera, many of them large and complicated. The specialized terminology poses a challenge to any translator or editor. Although we are confident of its accuracy, we offer this translation with the realization that there are certain to be imperfections.

It is essential to know from the outset that the translators have chosen to use the Latin term "capitulum" (pl. capitula), instead of the more familiar English term "head," for the Russian term denoting the primary inflorescence of florets. "Head" is used sometimes to describe secondary arrangements of the capitula, as are the other typical inflorescence terms (e.g., raceme or racemose).

This volume has also been reviewed in its entirety by Galina N. Fet, who has paid particular attention to the geographic and place-name terminology in the distribution statements following the morphological descriptions. Her detailed corrections of the geographic information and other editorial suggestions have added substantially to the accuracy of the translated work.

August 1998

STANWYN G. SHETLER
Curator of Botany Emeritus
National Museum of Natural History
Smithsonian Institution
Washington, DC 20560

Assisted by Galina N. Fet
Huntington, West Virginia 25701

PREFACE

The twenty-fifth volume of the *Flora of the USSR* is the first of six volumes describing the plants of the family Compositae. This is the least studied family in our native flora, and the systematics of many of its genera and species are not well worked out despite the fact that many indigenous genera, subgenera, and sections of the Compositae are widely distributed in Soviet Central Asia, the Caucasus, and the Far East.

The taxonomic difficulty of this family, the largest of the world's flora, is the reason the existing classifications in the world literature are so contradictory.

We have adopted as a basis the most prevalent and in many respects very convenient system worked out by O. Hoffmann. At the same time, it has become necessary to introduce certain changes to this system.

The first volume of the Compositae of our flora is the smallest in size, although it covers six tribes of the subfamily Carduoideae (Tubuliflorae): Eupatorieae, Astereae, Inuleae, Ambrosieae, Heliantheae, Helenieae. To them are referred 360 species of wild plants and 20 species of the most commonly cultivated, mostly ornamental plants.

Editorial Board

CONTRIBUTORS

Characteristics of Family Compositae, its tribes and subtribes; key to subfamilies; key to tribes of subfamily Carduoideae; keys to genera of tribes Astereae (with S.G. Tamamschjan) and Inuleae; genera *Helichrysum,* and *Gnaphalium*	: M.E. Kirpicznikov
Tribe Eupatorieae, except genus *Eupatorium*; tribe Astereae, except genera *Solidago, Callistephus, Galatella, Linosyris, Chamaegeron, Brachyactis, Erigeron, Lachnophyllum*, and *Baccharis*	: S.G. Tamamschjan
Genus *Eupatorium*	: N.L. Tsvetkova
Genus *Solidago*	: S.V. Juzepczuk
Genera *Galatella* and *Linosyris*	: N.N. Tzvelev
Genera *Chamaegeron, Brachyactis, Erigeron, Lachnophyllum*, and *Baccharis*	: V.P. Botschantzev
Genera *Karelinia, Symphyllocarpus, Micropus, Bombycilaena, Cymbolaena, Evax, Filago, Lasiopogon, Cyclachoena, Ambrosia, Xanthium*, and *Parthenium*	: L.A. Smoljaninova
Genera *Antennaria, Anaphalis, Phagnalon*, and *Cladochaeta*	: A.G. Borissova
Genus *Leontopodium*	: V.I. Grubov
Genera *Codonocephalum, Inula, Pentanema*, and *Tagetes*	: S.G. Gorschkova
Genera *Callistephus, Varthemia, Pulicaria, Amblyocarium, Carpesium, Adenocaulon, Pallenis*, and *Telekia*	: V.F. Golubkova
Keys to genera of tribes Ambrosieae, Heliantheae, Helenieae; tribe Heliantheae	: I.T. Vassilczenko
Reports on plant fossils	: P.I. Dorofeev
Addenda XXIV — Diagnoses plantarum novarum in tomo XXV Florae URSS commemoratarum	

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CONTENTS

SCIENTIFIC EDITOR'S PREFACE TO VOLUME XXV ... vii

PREFACE ... ix

CONTRIBUTORS ... x

SYSTEMATIC INDEX OF SPECIES OF THE TWENTY-FIFTH VOLUME OF THE FLORA OF THE USSR ... xv

FAMILY CLX. COMPOSITAE P.F. GMELIN ... 1

Subfamily I. Carduoideae Kitam. ... 14

Tribe 1. Eupatorieae Cass. ... 16

Subtribe 1. *Ageratinae* O. Hoffm. ... 17

Genus **Ageratum* L. ... 17

Genus **Stevia* Cav. ... 18

Genus 1452. *Eupatorium* L. ... 19

Subtribe 2. Adenostylinae O. Hoffm. ... 22

Genus 1453. *Adenostyles* Cass. ... 23

Genus *Liatris* Schreb. ... 24

Tribe 2. Astereae Cass. ... 24

Subtribe 1. Solidagininae O. Hoffm. ... 30

Genus 1454. *Grindelia* Willd. ... 30

Genus 1455. *Solidago* L. ... 31

Subtribe 2. Grangeinae Cass. ... 50

Genus 1456. *Dichrocephala* L'Hér. ... 51

Subtribe 3. Bellidinae O. Hoffm. ... 51

Genus 1457. *Myriactis* Less. ... 52

Genus 1458. *Bellis* L. ... 53

Subtribe 4. Asterinae O. Hoffm. ... 54

Genus 1459. *Boltonia* L'Hérit. ... 54

Genus 1460. *Gymnaster* Kitamura ... 56

Genus 1461. *Heteropappus* Less. ... 60

Genus **Callistephus* Cass. ... 71

Genus 1462. *Aster* L. ... 72

Genus 1463. *Kemulariella* Tamamsch. ... 104

Genus 1464. *Chamaegeron* Schrenk ... 111

Genus 1465. *Doellingeria* Nees ... 113

Genus 1466. *Kalimeris* Cass. ... 115

Genus 1467. *Asterothamnus* Novopokr. ... 117

Genus 1468. *Krylovia* Schischk. ... 121

Genus 1469. *Arctogeron* DC. ... 125

Genus 1470. *Turczaninowia* DC. ... 127

Genus 1471. *Galatella* Cass. ... 128

Genus 1472. *Linosyris* Cass. ... 162

Genus 1473. *Pseudolinosyris* Novopokr. ... 169

Genus 1474. *Tripolium* Nees ... 172

Genus 1475. *Conyzanthus* Tamamsch. gen. n. ... 174

Genus 1476. *Brachyactis* Ldb. ... 178

Genus 1477. *Erigeron* L. ... 180

Genus 1478. *Lachnophyllum* Bge. ... 270

Subtribe 5. Baccharidinae O. Hoffm. ... 271

Genus 1479. *Baccharis* L. ... 271

Tribe 3. Inuleae Cass. ... 272

Subtribe 1. Plucheinae Rchb. ... 277

Genus 1480. *Karelinia* Less. ... 277

Subtribe 2. Symphyllocarpinae Smoljan. ... 279

Genus 1481. *Symphyllocarpus* Maxim. ... 279

Subtribe 3. Filagininae O. Hoffm. ... 281

Genus 1482. *Micropus* L. ... 282

Genus 1483. *Bombycilaena* (DC.) Smoljan. ... 283

Genus 1484. *Cymbolaena* Smoljan. ... 286

Genus 1485. *Evax* Gaertn. ... 287

Genus 1486. *Filago* L. ... 293

Subtribe 4. Gnaphalinae Rchb. ... 303
  Genus 1487. *Antennaria* Gaertn. ... 304
  Genus 1488. *Leontopodium* R. Br. ... 318
  Genus 1489. *Anaphalis* DC. ... 337
  Genus 1490. *Lasiopogon* Cass. ... 352
  Genus 1491. *Phagnalon* Cass. ... 354
  Genus 1492. *Gnaphalium* L. ... 356
  Genus 1493. *Helichrysum* ... 378
  Genus 1494. *Cladochaeta* DC. ... 401
Subtribe 5. Inulinae O. Hoffm. ... 403
  Genus 1495. *Codonocephalum* Fenzl. ... 403
  Genus 1496. *Inula* L. ... 404
  Genus 1497. *Pentanema* Cass. ... 446
  Genus 1498. *Varthemia* DC. ... 454
  Genus 1499. *Pulicaria* Gaertn. ... 455
  Genus 1500. *Amblyocarpum* Fisch. and Mey. ... 464
  Genus 1501. *Carpesium* L. ... 465
  Genus 1502. *Adenocaulon* Hook. ... 472
Subtribe 6. Buphthalminae O. Hoffm. ... 474
  Genus 1503. *Pallenis* Cass. ... 475
  Genus 1504. *Telekia* Baumgart. ... 475
Tribe 4. Ambrosieae Cass. ... 477
  Subtribe 1. Cyclacheninae Kirp. ... 480
    Genus 1505. *Cyclachaena* Fresen. ... 480
  Subtribe 2. Ambrosiinae O. Hoffm. ... 482
    Genus 1506. *Ambrosia* L. ... 483
    Genus 1507. *Xanthium* L. ... 486
Tribe 5. Heliantheae Cass. ... 493
  Subtribe 1. Melampodinae O. Hoffm. ... 493
    Genus **Parthenium* L. ... 494
  Subtribe 2. Zinninae O. Hoffm. ... 496
    Genus **Zinnia* L. ... 496
    Genus **Sanvitalia* Gualt. ... 497

Genus **Heliopsis* Pers. ... 498
Subtribe 3. Verbesininae O. Hoffm. ... 499
Genus 1508. *Siegesbeckia* L. ... 500
Genus 1509. *Eclipta* L. ... 501
Genus **Rudbeckia* L. ... 502
Genus **Echinacea* Moench ... 504
Genus 1510. *Helianthus* L. ... 505
Subtribe 4. Coreopsidinae O. Hoffm. ... 509
Genus **Guizotia* Cass. ... 509
Genus **Coreopsis* L. ... 510
Genus **Dahlia* Cav. ... 512
Genus 1511. *Bidens* L. ... 514
Genus **Cosmos* Cav. ... 524
Subtribe 5. Galinsoginae O. Hoffm. ... 525
Genus 1512. *Galinsoga* Ruiz. and Pav. ... 525
Subtribe 6. Madinae O. Hoffm. ... 528
Genus **Madia* Mol. ... 528
Genus **Laya* Hook. and Arn. ... 529
Tribe 6. Helenieae Cass. ... 530
Subtribe 1. Tagetininae O. Hoffm. ... 530
Genus **Tagetes* L. ... 531
ADDENDA XXIV. IDENTIFICATION OF NEW SPECIES INCLUDED IN VOL. XXV ... 534
INDEX ALPHABETICUS ... 555

VII
SYSTEMATIC INDEX OF SPECIES OF THE TWENTY-FIFTH VOLUME OF THE “FLORA OF THE USSR”[†]

Family CLX. Compositae P.F. Gmelin

Subfamily I. Carduoideae Kitam.

Tribe 1. Eupatorieae Cass.

Subtribe 1. Ageratinae O. Hoffm.

Genus *Ageratum L.

1. *A. houstonianum* Mill. ... 17

Genus **Stevia* Cav.

14010. 1. *S. ovata* Willd. ... 18

Genus 1452. *Eupatorium* L.

1. *E. cannabinum* L. ... 19
2. *E. lindleyanum* DC. ... 20
3. *E. glehnii* Fr. Schmidt ... 21

Subtribe 2. Adenostylinae O. Hoffm.

Genus 1453. *Adenostyles* Cass.

1. *A. alliariae* (Gouan) Kern. ... 22

Genus **Liatris* Schreb.

1. *L. spicata* (L.) Willd. ... 23

[†] Transcribed and translated as necessary from the Russian original. The page numbers of the Russian edition appear in the left-hand margin of the text—General Editor.

Tribe 2. Astereae Cass.

Subtribe 1. Solidagininae O. Hoffm.

Genus 1454. *Grindelia* Willd.

1. *G. squarrosa* (Pursh) Dunal. ... 30

VIII Genus 1455. *Solidago* L.

Subgenus I. *Virgaurea* DC.

Section 1. Thyrsiflorae A. Gray

1. *S. virgaurea* L. ... 34
2. *S. turfosa* Woron. ... 36
3. *S. taurica* Juz. ... 36
4. *S. jailarum* Juz. ... 39
5. *S. alpestris* Waldst. and Kit. ... 39
14020. 6. *S. caucasica* Kem.-Nat. ... 40
7. *S. armena* Kem.-Nat. ... 41
8. *S. lapponica* Wither. ... 41
9. *S. dahurica* Kitag. ... 42
10. *S. gebleri* Juz. ... 43
11. *S. kuhistanica* M. Pop. ... 44
12. *S. pacifica* Juz. ... 44
13. *S. kurilensis* Juz. ... 45
14. *S. spiraeifolia* Fisch. ... 45
15. *S. cuprea* Juz. ... 46
14030. 16. *S. compacta* Turcz. ... 47

Section 2. Paniculatae A. Gray

*S. *serotina* Ait. ... 48
17. *S. canadensis* Raf. ... 48
*S. *rupestris* Ait. ... 49
*S. *arguta* ... 49
*S. *neglecta* Torr. and Gr. ... 49
*S. *juncea* Ait. ... 50
*S. *odora* Ait. ... 50

Subgenus II. *Euthamia* Ell.

*S. *graminifolia* (L.) Ell. ... 50

Subtribe 2. Grangeinae Cass.

Genus 1456. *Dichrocephala* L'Hér.

1. *D. bicolor* (Roth.) Schltd. ... 51

Subtribe 3. Bellidinae O. Hoffm.

Genus 1457. *Myriactis* Less.

1. *M. gmelinii* (Fisch. and Mey.) DC. ... 52

Genus 1458. *Bellis* L.

1. *B. hyrcanica* Woron. ... 53
2. *B. perennis* L. ... 54

Subtribe 4. Asterinae O. Hoffm.

Genus 1459. *Boltonia* L'Hérit.

1. *B. lautureana* Deb. ... 55

IX Genus 1460. *Gymnaster* Kitamura

1. *G. savatieri* (Makino) Kitamura ... 56

Genus 1461. *Heteropappus* Less.

Section 1. Pseudocalimeris Tamamsch.

1. *H. distortus* (Turcz.) Tamamsch. ... 66
2. *H. altaicus* (Willd.) Novopokr. ... 66
3. *H. alberti* (Rgl.) Novopokr. and Tamamsch. ... 67
14040. 4. *H. canescens* (Nees) Novopokr. ... 67

Section 2. Pseudoaster Tamamsch.

5. *H. medius* (Kryl.) Tamamsch. ... 68
6. *H. pinetorum* Kom. ... 69
7. *H. hispidus* (Thunb.) Less. ... 69
8. *H. saxomarinus* Kom. ... 70
9. *H. elisabethinus* Tamamsch. ... 70
10. *H. noneifolius* Tamamsch. ... 71
11. *H. tataricus* (Lindl.) Tamamsch. ... 71
12. *H. meyendorfii* (Rgl. and Maack) Kom. and Alis. ... 72

Genus **Callistephus* Cass.

1. *C. chinensis* (L.) Nees ... 74

Genus 1462. *Aster* L.

Section 1. Genuini Nees

14050. 1. *A. novi-belgii* L. ... 83
2. *A. parviceps* (Burg.) Mackenzie and Bush ... 84
3. *A. laevis* L. ... 84
4. *A. salignus* Willd. ... 84

Section 2. Amellus Nees

5. *A. novae-angliae* L. ... 86
6. *A. amellus* L. ... 86
7. *A. amelloides* Bess. ... 87
8. *A. ibericus* Stev. ... 87
9. *A. glehnii* Fr. Schm. ... 91
10. *A. tataricus* L. ... 92
14060. 11. *A. fauriei* Lev. and Vaniot ... 93
12. *A. maackii* Rgl. ... 93
13. *A. sibiricus* L. ... 94
14. *A. subintegerrimus* (Trautv.) Ostenf. and Resvoll. ... 95
15. *A. richardsonii* Spreng. ... 96

Section 3. Ageraton Tamamsch.

16. *A. suputinicus* Tamamsch. ... 99
17. *A. ageratoides* Turcz. ... 100
18. *A. luxurifolius* Tamamsch. ... 100
19. *A. see-burejensis* Tamamsch. ... 101
20. *A. pensauensis* Tamamsch. ... 102
14070. 21. *A. sutschanensis* Kom. ... 103

X Section 4. Alpinaster Tamamsch.

22. *A. alpinus* L. ... 105
23. *A. tolmatschevii* Tamamsch. ... 107
24. *A. serpentimontanus* Tamamsch. ... 108
25. *A. korshinskyi* Tamamsch. ... 109
26. *A. fallax* Tamamsch. ... 109

Genus 1463. *Kemulariella* Tamamsch.

Section 1. Caucasica Kem.-Nat.

1. *K. caucasica* (Willd.) Tamamsch. ... 112

Section 2. Thamnoaster Tamamsch.

2. *K. rosea* (Stev.) Tamamsch. ... 115
3. *K. abchasica* (Kem.-Nat.) Tamamsch. ... 116
4. *K. tugana* (Alb.) Tamamsch. ... 116
14080. 5. *K. albovii* Tamamsch. ... 117
6. *K. colchica* (Alb.) Tamamsch. ... 117

Genus 1464. *Chamaeogeron* Schrenk

1. Ch. bungei (Boiss.) Botsch. ... 119
2. Ch. oligocephalus Schrenk ... 120

Genus 1465. *Doellingeria* Nees

1. *D. scabra* (Thunb.) Nees ... 121

Genus 1466. *Kalimeris* Cass.

1. *K. integrifolia* Turcz. ... 123
2. *K. incisa* (Fisch.) DC. ... 123

Genus 1467. *Asterothamnus* Novopokr.

1. *A. heteropappoides* Novopokr. ... 125
2. *A. poliifolius* Novopokr. ... 126
3. *A. fruticosus* (Winkl.) Novopokr. ... 126
14090. 4. *A. schischkinii* Tamamsch. ... 129

Genus 1468. *Krylovia* Schischk.

1. *K. limoniifolia* (Less.) Schischk. ... 130
2. *K. popovii* (Botsch.) Tamamsch. ... 131
3. *K. eremophila* (Bge.) Schischk. ... 132
4. *K. novopokrovskyi* (Krasch. and Iljin) Tamamsch ... 135

Genus 1469. *Arctogeron* DC.

1. *A. gramineum* (L.) DC. ... 136

Genus 1470. *Turczaninowia* DC.

1. *T. fastigiata* (Fisch.) DC. ... 137

XI

Genus 1471. *Galatella* Cass.

Section 1. Galatella

1. *G. dahurica* DC. ... 143
2. *G. altaica* Tzvel. ... 144
3. *G. macrosciadia* Gandog. ... 145
14100. 4. *G. chromopappus* Novopokr. ... 149
5. *G. villosula* Novopokr. ... 150
6. *G. biflora* (L.) Nees ... 151
7. *G. trinervifolia* (Less.) Novopokr. ... 152
8. *G. regelii* Tzvel. ... 153
9. *G. punctata* (W. and K.) Nees ... 154
10. *G. coriacea* Novopokr. ... 156
11. *G. fastigiiformis* Novopokr. ... 157
12. *G. hissarica* Novopokr. ... 158
13. *G. litvinovii* Novopokr. ... 158
14110. 14. *G. pastuchovii* (Kem.-Nat.) Tzvel. ... 159
15. *G. eldarica* Kem.-Nat. ... 160
16. *G. sosnovskyana* Kem.-Nat. ... 161
17. *G. dracunculoides* (Lam.) Nees ... 162

Section 2. Xylogalatella Novopokr.

18. *G. saxatilis* (M. Pop. ex Novopokr.) Novopokr. ... 163

Section 3. Oreophilon Novopokr.

19. *G. tianschanica* Novopokr. ... 164
20. *G. polygaloides* Novopokr. ... 165

Section 4. Fastigiatae Novopokr.

21. *G. hauptii* (Ldb.) Lindl. ... 166
22. *G. angustissima* (Tausch) Novopokr. ... 167
23. *G. divaricata* (Fisch. ex M.B.) Novopokr. ... 172
14120. 24. *G. scoparia* (Kar. and Kir.) Novopokr. ... 172

Genus 1472. *Linosyris* Cass.

Section 1. Linosyris

1. *L. vulgaris* Cass. ... 175
2. *L. fominii* Kem.-Nat. ... 176
3. *L. pontica* (Lipsky) Novopokr. ... 177

Section 2. Crinitaria (Cass.) Kem.-Nat.

4. *L. villosa* (L.) DC. ... 178
5. *L. tatarica* (Less.) C.A.M. ... 179

Genus 1473. *Pseudolinosyris* Novopokr.

1. *P. grimmii* (Rgl. and Schmalh.) Novopokr. ... 181
2. *P. microcephala* (Novopokr.) Tamamsch. ... 183
3. *P. sintenisii* (Bornm.) Tamamsch. ... 183

Genus 1474. *Tripolium* Nees

1. *T. vulgare* Nees ... 184

XII Genus 1475. *Conyzanthus* Tamamsch.

14130. 1. *C. graminifolius* (Spreng.) Tamamsch. ... 186
2. *C. squamatus* (Spreng.) Tamamsch. ... 186

Genus 1476. *Brachyactis* Ldb.

1. *B. ciliata* Ldb. ... 189

Genus 1477. *Erigeron* L.

Subgenus I. *Euerigeron* (DC.) M. Pop.

Section 1. Platyglossa Botsch.

1. *E. peregrinus* (Pursh) Greene ... 200
2. *E. leioreades* M. Pop. ... 201
3. *E. seravschanicus* M. Pop. ... 202
4. *E. altaicus* M. Pop. ... 203
5. *E. vicarius* Botsch. ... 204
6. *E. azureus* Rgl. ... 207
7. *E. allochrous* Botsch. ... 208
14140. 8. *E. aurantiacus* Rgl. ... 209
9. *E. venustus* Botsch. ... 210

10. *E. silenifolius* (Turcz.) Botsch. ... 212
11. *E. koraginensis* (Kom.) Botsch. ... 212
12. *E. komarovii* Botsch. ... 213
13. *E. thunbergii* A. Gray ... 214
14. *E. oharai* (Nakai) Botsch. ... 216
15. *E. flaccidus* (Bge.) Botsch. ... 217
16. *E. heterochaeta* (Benth. ex Clarke) Botsch. ... 218

Section 2. Siphonoglossa Botsch.

17. *E. petiolaris* Vierh. ... 219
14150. 18. *E. plurifolius* Botsch. ... 223
19. *E. polymorphus* Scop. ... 224
20. *E. schalbusi* Vierh. ... 225
21. *E. pallidus* M. Pop. ... 225
22. *E. sogdianus* M. Pop. ... 226
23. *E. caucasicus* Stev. ... 227
24. *E. uniflorus* L. ... 227
25. *E. eriocalyx* (Ldb.) Vierh. ... 228
26. *E. lachnocephalus* Botsch. ... 230
27. *E. petroiketes* Rech. ... 231
14160. 28. *E. eriocephalus* J. Vahl ... 232
29. *E. humilis* Grah. ... 233
30. *E. lonchophyllus* Hook. ... 234
31. *E. popovii* Botsch. ... 235
32. *E. oreades* (Schrenk) Fisch. and Mey. ... 236
33. *E. pseuderiocephalus* M. Pop. ... 237
34. *E. trimorphopsis* Botsch. ... 238

Section 3. Caenotus Nutt.

35. *E. canadensis* L. ... 239
36. *E. bonariensis* L. ... 240

XIII Section 4. Phalacroloma (Cass.) Torrey and Gray

37. *E. annuus* (L.) Pers. ... 244
14170. 38. *E. strigosus* Mühl. ... 245

Subgenus II. *Trimorpha* (Cass.) M. Pop.

Section 1. Brachyglossa Vierh.

39. *E. acer* L. ... 246
40. *E. kamtschaticus* DC. ... 248

41. *E. podolicus* Bess. ... 249
42. *E. baicalensis* Botsch. ... 250
43. *E. elongatus* Ldb. ... 251

Section 2. Macroglossae Vierh.

44. *E. alpinus* L. ... 252
45. *E. borealis* (Vierh.) Simrn. ... 253
46. *E. krylovii* Serg. ... 254
47. *E. violaceus* M. Pop. ... 257
14180. 48. *E. pseudoseravschanicus* Botsch. ... 258
49. *E. tianschanicus* Botsch. ... 259
50. *E. bellidiformis* M. Pop. ... 260
51. *E. orientalis* Boiss. ... 261
52. *E. hissaricus* Botsch. ... 262
53. *E. badachschanicus* Botsch. ... 263
54. *E. pseudelongatus* Botsch. ... 264
55. *E. schmalhausenii* M. Pop. ... 264

Section 3. Longisquamatae Botsch.

56. *E. sachalinensis* Botsch. ... 266

Subgenus III. *Conyzastrum* (Boiss.) M. Pop.

Section 1. Psychrogeton (Boiss.) Botsch.

57. *E. pseuderigeron* (Bge.) M. Pop. ... 267
14190. 58. *E. primuloides* M. Pop. ... 268
59. *E. brachyspermus* Botsch. ... 269
60. *E. olgae* Rgl. and Schmalh. ... 270
61. *E. alexeenkoi* Krasch. ... 271
62. *E. karatavicus* Pavl. ... 272
63. *E. leucophyllus* (Bge.) Boiss. ... 272
64. *E. andryaloides* (DC.) Benth. ... 274
65. *E. poncinsii* (Franch.) Botsch. ... 275
66. *E. cabulicus* (Boiss). Botsch. ... 277
67. *E. dolichostylus* Botsch. ... 278
14200. 68. *E. biramosus* Botsch. ... 279

Section 2. Euconyzastrum Botsch.

69. *E. khorossanicus* Boiss. ... 280
70. *E. nigromontanus* Boiss. ... 282
71. *E. umbrosus* (Kar. and Kir.) Boiss. ... 285

72. *E. crispus* Pourr. ... 286

XIV Genus 1478. *Lachnophyllum* Bge.

1. *L. gossypinum* Bge. ... 288

Subtribe 5. Baccharidinae O. Hoffm.

Genus 1479. *Baccharis* L.

1. *B. halimifolia* L. ... 289

Tribe 3. Inuleae Cass.

Subtribe 1. Plucheinae Rchb.

Genus 1480. *Karelinia* Less.

1. *K. caspia* (Pall.) Less. ... 296

Subtribe 2. Symphyllocarpinae Smoljan.

Genus 1481. *Symphyllocarpus* Maxim.

1. *S. exilis* Maxim. ... 298

Subtribe 3. Filagininae O. Hoffm.

Genus 1482. *Micropus* L.

1. *M. supinus* L. ... 300

Genus 1483. *Bombycilaena* (DC.) Smoljan.

14210 1. *B. erecta* (L.) Smoljan. ... 302

Genus 1484. *Cymbolaena* Smoljan.

1. *C. longifolia* (Boiss. and Reut.) Smoljan. ... 306

Genus 1485. *Evax* Gaertn.

Section 1. Euevax DC.

1. *E. anatolica* Boiss. and Heldr. ... 308
2. *E. contracta* Boiss. ... 309

Section 2. Evacella Smoljan.

3. *E. arenaria* Smoljan. ... 310

Section 3. Pseudevax DC.

4. *E. micropodioides* Willk. ... 313

Section 4. Filaginoides Smoljan.

5. *E. filaginoides* Kar. and Kir. ... 313

Genus 1486. *Filago* L.

Section 1. Gifola (Cass.) DC.

1. *F. germanica* L. ... 316
2. *F. eriocephala* Guss. ... 317
XV 3. *F. bornmülleri* Hausskn. ... 318
14220. 4. *F. spathulata* Presl ... 321

Section 2. Oglifa (Cass.) DC.

5. *F. arvensis* L. ... 322
6. *F. montana* L. ... 323
7. *F. lagopus* Parl. ... 323
8. *F. minima* (Sm.) Pers. ... 324
9. *F. gallica* L. ... 325

Subtribe 4. Gnaphalinae Rchb.

Genus 1487. *Antennaria* Gaertn.

Section 1. Catipes DC.

1. *A. dioica* (L.) Gaertn. ... 329
2. *A. caucasica* Boriss. ... 330
3. *A. dioiciformis* Kom. ... 334
4. *A. monocephala* DC. ... 334
14230. 5. *A. komarovii* Juz. ... 335
6. *A. alpina* (L.) Gaertn. ... 336

Section 2. Urolepis Boriss.

7. *A. friesiana* (Trautv.) Ekman ... 337
8. *A. carpatica* (Wahlenb.) R. Br. ... 338
9. *A. villifera* Boriss. ... 340

Genus 1488. *Leontopodium* R. Br.

1. *L. palibinianum* Beauv. ... 345
2. *L. discolor* Beauv. ... 346
3. *L. kurilense* Takeda ... 348
4. *L. leontopodioides* (Willd.) Beauv. ... 349
5. *L. ochroleucum* Beauv. ... 350
5a. *L. ochroleucum* Beauv. var. *campestre* (Ldb.) Grub. ... 354
5b. *L. ochroleucum* Beauv. var. *conglobatum* (Turcz.) Grub. ... 355
14240. 6. *L. brachyactis* Gandoger ... 358
7. *L. nanum* (Hook. f. and Thoms.) Hand.-Mazz. ... 359
8. *L. alpinum* Cass. ... 360

Genus 1489. *Anaphalis* DC.

Section 1. Anaphalis

1. *A. serawschanica* (Winkl.) B. Fedtsch. ... 364

Section 2. Polycephalos Boriss.

2. *A. margaritacea* (L.) Benth. and Hook. ... 365
3. *A. possietica* Kom. ... 366
4. *A. tenuicaulis* Boriss. ... 367
5. *A. velutina* Krasch. ... 368
6. *A. depauperata* Boriss. ... 371
7. *A. racemifera* Franch. ... 372
14250. 8. *A. garanica* Boriss. ... 373
9. *A. virgata* Thoms. ... 374
10. *A. roseo-alba* Krasch. ... 374
11. *A. darvasica* Boriss. ... 375
12. *A. scopulosa* Boriss. ... 376

Genus 1490. *Lasiopogon* Cass.

1. *L. muscoides* (Desf.) DC. ... 377

Genus 1491. *Phagnalon* Cass.

1. *P. darvazicum* Krasch. ... 379
2. *P. androssovii* B. Fedtsch. ... 380

Genus 1492. *Gnaphalium* L.

Subgenus I. *Gnaphalium*

1. *G. tranzschelii* Kirp. ... 384
2. *G. mandshuricum* Kirp. ... 385
14260. 3. *G. baicalense* Kirp. ... 386
4. *G. rossicum* Kirp. ... 390
5. *G. sibiricum* Kirp. ... 390
6. *G. kasachstanicum* Kirp. ... 391
7. *G. uliginosum* L. ... 391

Section 2. Calolepis Kirp.

8. *G. luteo-album* L. ... 395
**G. affine* D. Don ... 396

Subgenus II. *Synchaeta* Kirp.

9. *G. sylvaticum* L. ... 397
10. *G. norvegicum* Gunn. ... 398
11. *G. caucasicum* Somm. and Lev. ... 401

Subgenus III. *Omalotheca* Endl.

12. *G. supinum* L. ...

Genus 1493. *Helichrysum*

Subgenus *Helichrysum*

Section Helichrysum

14270. 1. *H. arenarium* (L.) Moench ... 410
2. *H. undulatum* Ldb. ... 412
3. *H. kopetdagense* Kirp. ... 415
4. *H. thianschanicum* Rgl. ... 415
5. *H. mussae* Nevski ... 417
6. *H. nuratavicum* Krasch. ... 417
7. *H. polyphyllum* Ldb. ... 418
8. *H. plicatum* (Fisch. and Mey.) DC. ... 419
9. *H. maracandicum* M. Pop. ... 420
10. *H. graveolens* (M.B.) Sweet ... 421
XVII 14280. 11. *H. armenium* (Fisch. and Mey.) DC. ... 422
12. *H. araxinum* Takht. ... 424
13. *H. callichrysum* (Fisch. and Mey.) DC. ... 424

14. *H. polylepis* Bordz. ... 427
15. *H. pallasii* (Spreng.) Ldb. ... 428
16. *H. aurantiacum* Boiss. and Huet ... 429

Genus 1494. *Cladochaeta* DC.

1. *C. candidissima* (M.B.) DC. ... 431
2. *C. caspica* Sosn. ... 431

Subtribe 5. Inulinae O. Hoffm.

Genus 1495. *Codonocephalum* Fenzl

1. *C. paecockianum* Aitch. and Hemsl. ... 432

Genus 1496. *Inula* L.

Section 1. Corvisartia (Merat) Dumort.

1. *I. helenium* L. ... 440
14290. 2. *I. grandis* Schrenk ... 441
3. *I. magnifica* Lipsky ... 442

Section 2. Enula Duby

4. *I. grandiflora* Willd. ... 444
5. *I. orientalis* Lam. ... 447
6. *I. seidlitzii* Boiss. ... 448
7. *I. hirta* L. ... 449
8. *I. ensifolia* L. ... 449
9. *I. germanica* L. ... 451
10. *I. aspera* Poir. ... 452
11. *I. sabuletorum* Czern. ... 453
14300. 12. *I. salicina* L. ... 454
13. *I. kitamurana* Tatew. ... 456
14. *I. montbretiana* DC. ... 457
15. *I. mariae* Bordz. ... 457
16. *I. glauca* Winkl. ... 458
17. *I. schmalhausenii* Winkl. ... 459
18. *I. caspica* Blum. ... 460
19. *I. oculus-christi* L. ... 461
20. *I. auriculata* Boiss. ... 462
21. *I. grombczewskii* Winkl. ... 463
14310. 22. *I. rubtzovii* Gorschk. ... 464
23. *I. britannica* L. ... 465

24. *I. macrolepis* Bge. ... 467
25. *I. linariifolia* Turcz. ... 468
26. *I. japonica* Thunb. ... 468

Section 3. Aegophathalmus Schott and Kotschy

27. *I. acaulis* Schott and Kotschy ... 471
28. *I. rhizocephala* Schrenk ... 472

XVIII Section 4. Breviligulatae (Beck) Gorschk.

29. *I. vulgaris* (Lam.) Trevisan ... 473
30. *I. thapsoides* (Willd.) DC. ... 474
31. *I. decurrens* M. Pop. ... 475
14320. 32. *I. multicaulis* Fisch. and Mey. ... 475

Section 5. Limbarda (Adans.) DC.

33. *I. salsoloides* (Turcz.) Ostenf. ... 476

Genus 1497. *Pentanema* Cass.

1. *P. albertoregelia* (Winkl.) Gorschk. ... 479
2. *P. divaricatum* Cass. ... 480
3. *P. rupicola* (Krasch.) Gorschk. ... 483
4. *P. parietarioides* (Nevski) Groschk. ... 484
5. *P. propinquum* Nevski ... 484
6. *P. glanduligerum* (Krasch.) Gorschk. ... 485

Genus 1498. *Varthemia* DC.

1. *V. persica* DC. ... 486

Genus 1499. *Pulicaria* Gaertn.

Section 1. Eupulicaria Hoffm.

1. *P. prostrata* (Gilib.) Aschers. ... 489
14330. 2. *P. dysenterica* (L.) Gaertn. ... 490
3. *P. uliginosa* Stev. ... 491
4. *P. salviifolia* Bge. ... 495
5. *P. gnaphalodes* (Vent.) Boiss. ... 496

Genus 1500. *Amblyocarpum* Fisch. and Mey.

1. *A. inuloides* Fisch. and Mey. ... 497

Genus 1501. *Carpesium* L.

Section 1. Conyzoides DC.

1. *C. cernuum* L. ... 501
2. *C. eximium* Winkl. ... 502
3. *C. triste* Maxim. ... 503

Section 2. Abrotanoides DC.

4. *C. abrotanoides* L. ... 505

Genus 1502. *Adenocaulon* Hook.

1. *A. adhaerescens* Maxim. ... 507

Subtribe 6. Buphthalminae O. Hoffm.

Genus 1503. *Pallenis* Cass.

14340. 1. *P. spinosa* (L.) Cass. ... 508

XIX Genus 1504. *Telekia* Baumgart.

1. *T. speciosa* (Schreb.) Baumg. ... 510

Tribe 4. Ambrosieae Cass.

Subtribe 1. Cyclacheninae Kirp.

Genus 1505. *Cyclachaena* Fresen.

1. *C. xanthifolia* (Nutt.) Fresen. ... 515

Subtribe 2. Ambrosiinae O. Hoffm.

Genus 1506. *Ambrosia* L.

Section 1. Euambrosia Torr. and Gr.

1. *A. artemisiifolia* L. ... 519
2. *A. psilostachya* DC. ... 519
3. *A. trifida* L. ... 520
4. *A. aptera* DC. ... 520

Genus 1507. *Xanthium* L.

Section 1. Acanthoxanthium DC.

1. *X. spinosum* L. ... 523

Section 2. Euxanthium DC.

Subsection 1. Orthorrhyncha Wallroth

2. *X. sibiricum* Patrin ... 524
14350. 3. *X. strumarium* L. ... 524

Subsection 2. Campylorrhyncha Wallroth

4. *X. occidentale* Bertol. ... 525
5. *X. californicum* Greene ... 526
6. *X. riparium* Itz. and Hertsch. ... 529

Tribe 5. Heliantheae Cass.

Subtribe 1. Melampodinae O. Hoffm.

Genus **Parthenium* L.

1. *P. argentatum* Gray ... 530

Subtribe 2. Zinninae O. Hoffm.

Genus **Zinnia* L.

1. *Z. elegans* Jacq. ... 532

Genus **Sanvitalia* Gualt.

1. *S. procumbens* Lam. ... 534

XX

Genus **Heliopsis* Pers.

1. *H. scabra* Dun. ... 535

Subtribe 3. Verbesininae O. Hoffm.

Genus 1508. *Siegesbeckia* L.

1. *S. orientalis* L. ... 536

Genus 1509. *Eclipta* L.

1. *E. prostrata* L. ... 537
2. *E. alba* (L.) Hasskarl. ... 538

Genus **Rudbeckia* L.

1. *R. hirta* L. ... 539
2. *R. laciniata* L. ... 540

Genus **Echinacea* Moench

1. *E. purpurea* (L.) Moench ... 541

Genus 1510. *Helianthus* L.

1. *H. annuus* L. ... 542
2. *H. tuberosus* L. ... 544
3. *H. atrirubens* L. ... 544

Subtribe 4. Coreopsidinae O. Hoffm.

Genus **Guizotia* Cass.

1. *G. abyssinica* (L.f.) Cass. ... 545

Genus **Coreopsis* L.

1. *C. grandiflora* Hoog. ... 547
2. *C. tinctoria* Nutt. ... 547

Genus **Dahlia* Cav.

1. *D. pinnata* Cav. ... 548

Genus 1511. *Bidens* L.

14360. 1. *B. cernua* L. ... 555
2. *B. kamtschatica* Vass. ... 556
3. *B. tripartita* L. ... 557
4. *B. radiata* Thuill. ... 558
5. *B. maximovicziana* Oett. ... 559
6. *B. frondosa* L. ... 559
7. *B. parviflora* Willd. ... 560
8. *B. bipinnata* L. ... 561

Genus *Cosmos* Cav.

1. *C. bipinnatus* Cav. ... 562

XXI Subtribe 5. Galinsoginae O. Hoffm.

Genus 1512. *Galinsoga* Ruiz. and Pav.

1. *G. parviflora* Cav. ... 563
14370. 2. *G. quadriradiata* Ruiz. and Pav. ... 564

Subtribe 6. Madinae O. Hoffm.

Genus *Madia* Mol.

1. *M. sativa* Mol. ... 567

Genus *Laya* Hook. and Arn.

1. *L. elegans* Torr. and Gr. ... 568

Tribe 6. Helenieae Cass.

Genus *Tagetes* L.

1. *T. minuta* L. ... 570
2. *T. patula* L. ... 571
3. *T. erecta* L. ... 571

1

Family CLX. COMPOSITAE P.F. GMELIN[1]

The flowers, generally of small size and diverse structure, are arranged in an inflorescence called a calathium [*korzinka*]* (calathidium; flos compositus of early authors and Linnaeus), but frequently also called a head [*golovka*] (capitulum auct. plur.) (It is better not to use the latter term, because "head" is used for genetically heterogeneous [non-homologous] inflorescences of a number of members of the Leguminosae, Dipsacaceae, and other families, while the term "calathium" is specific to the Compositae.) From the morphological point of view, the capitulum [*korzinka*] represents a type of botryoid [bunched racemose] (monopodial) inflorescence, characterized by a broadened and thickened axis, to which are attached the individual flowers. In the opinion of many authors, the capitulum is a modified umbel in which the pedicels of the flowers are more or less completely reduced but the main axis is greatly thickened. Biologically, the capitulum imitates a single large flower. (For details regarding the origin of the capitulum [i.e., *korzinka*] and the compound inflorescences in the Compositae, see the paper by Al.A. Fedorov "Anomalies in Certain Composites and Their Significance for Understanding the Ways of Inflorescence Formation in the Family Compositae," *Bot. Zhurnal*, Vol. XXXV, No. 2, 1950.)

The size of the capitulum varies from several millimeters (for example, *Filago minima*) to 30–40 centimeters (*Helianthus annuus*) across. The shape of the capitulum also is extremely variable (depending primarily on the structure of receptacle and involucre; see below). The capitulum can be globose, hemispherical, ovoid, cylindrical, conical, turbinate (top-shaped), flat, and more rarely even some other shape. Usually, the capitulum has a stalk (penduncle — pendunculus), or the stalk is not developed, and then the capitulum is termed sessile; in certain cases the capitulum is situated at the tip of a typical scape. There may be one to many capitula on a single plant. Frequently, a considerable number of capitula are clustered or, so to speak, crowded together, but most often the capitula, themselves inflorescences, are arranged in compund inflorescences of different types: spicate, paniculate, racemose, corymbiform, capitate, glomerules, etc.

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[1] By M.E. Kirpicznikov.

*Despite the author's preference for "calathium," the Russian word *korzinka* hereafter is translated "capitulum" (Latin for "little head"), the older and more widely used term for the primary aggregation of florets characteristic of the Compositae. The vernacular term "head" is used for the secondary clusters of capitula.—Translators.

The capitulum has a more or less enlarged and thickened base (highly telescoped and flattened axis) to which the individual flowers are at- 2 tached. This base (which, it appears, from the view point of modern morphology, is more correctly termed the receptacle of the inflorescence) is called the common receptacle (receptaculum commune — according to Linnaeus and many authors) but shortened, particularly of late, simply to receptacle (receptaculum; clinanthium — according to Cassini, rachis —according to Lessing). For all volumes of the *Flora of the USSR* devoted to the Compositae, the term receptacle (receptaculum) has been adopted.

The morphology of the receptacle is extremely varied. In general shape it may be flat, concave, convex, spherical, conical, or cylindrical; more rarely, it also may be other shapes. In some composites (for example, *Rudbeckia*) the receptacle is greatly elongated. All the above-mentioned types of receptacle are connected by intermediate forms, and sometimes in the same species the shape of the receptacle changes, depending on age.

A cross section of the receptacle reveals whether it is hollow or (more often!) filled with loose or compact (fleshy) tissue. The surface of the receptacle is also diverse. It is glabrous, but sometimes provided with scales, bristles, hairs and other structures that are considered to be modified bracts. The details of their structure vary greatly; for example, the membranous bracts may be folded lengthwise, enclosing the flower; they also may be entire or dissected into lobes, etc.

The flowers of composites, being attached to the surface of the receptacle, leave scars in the form of depressions (pits, alveolae), protuberances, dots, etc. Consequently, the distinguishable receptacle types are grooved, alveolate, honeycombed, punctate, tuberculate, and others, as well as a series of forms intermediate between the basic types.

The receptacle, together with the flowers attached to it, is surrounded by the more or less modified terminal leaves, forming the so-called involucre (involucrum; *pokryvalo* [spathe] and, less often, *povoloka* [sheath] of many Russian authors, particularly the earlier ones; calyx communis or "common calyx" of Linnaeus and his immediate successors; involucrum commune of many early as well as more contemporary authors). Only in rare cases (for example, *Echinops*) there is not a common involucre, and each flower is enclosed by its own, individual involucre, usually consisting of bristly scales [pales].

The shape of the involucre usually indicates the shape of the capitulum also. Therefore, in numerous publications on the composites, the shape of the capitulum is not mentioned at all, but the characteristic shape of the involucre is given. The involucre is characterized as: globose, hemispherical, cylindrical, conical, ovoid and so on. The elements forming the involucre are called bracts or involucral [or floral] bracts (involucri squamae, i. bracteae), but usually involucral leaflets [or phyllaries] (involucri phylla; i. foliola, anthodii phylla, phyllaria). Although from the morphological view point the last term cannot be considered entirely appropriate (a leaflet is a part of a compound leaf), we will use it, because the concept of "involucral leaflets" [*listochki obertki*]* has been deeply rooted in the Russian scientific literature and cannot be confused with anything else. 3 The involucre as a whole is more or less glabrous or with varying degrees of pubescence; for example, it may be covered with cobwebby hairs, as in many species of the genus *Arctium* or, particularly, in the genus *Leontopodium*. Sometimes the involucral bracts are more or less densely covered with glandular hairs of various types (for example, in some species of *Aster*) or with so-called punctate glands (for example, in *Brachanthemum gobicum*). The number of involucral bracts varies within very wide limits. Mostly, the involucral bracts are free; less commonly they are more or less fused with each other. The involucre may be formed by one, two, three, or many series of bracts. In the latter case, either all of them are more or less similar in shape and size, or they differ conspicuously from each other. Sometimes the outer series of involucral bracts is appreciably reduced and isolated as, for example, in many species of *Senecio* (forming the so-called involucrum calyculatum). In many cases the outer involucral bracts are distinguished by color, shape, and other characters from the middle and innermost ones. Often the bracts of a multiseriate involucre are imbricate; if in such cases their apices are recurved, then the involucre is termed squarrose. In consistency the involucral bracts are herbaceous, scaly, leathery, etc. On the involucral bracts the presence of so-called armaments — hooks, spiny protuberances, etc., is particularly to be noted. The presence of hooks on the involucre, as, for example, in *Arctium*, facilitates the dispersal of the fruits by animals. In many composites, the apex of the involucral bracts is extended into a so-called appendage (appendix), which may be spiny (with simple, multisegmented, branched, or other types of spines), scarious, fimbriate, or of other types. Appendages of various kinds are particularly characteristic of many Cynareae. In some Compositae these appendages are yellow, reddish, or otherwise colored. Variously shining and often brightly colored involucral bracts on the whole are often observed in the Compositae and are characteristic of many species and genera having small, inconspicuous flowers (typical examples are *Xeranthemum*, *Helichrysum*). Sometimes, not all but only part of the involucral bracts are colored, scarious and lustrous; thus, in many species of *Cousinia* the inner bracts, sharply distinguishable from the more external ones, are membranous, lustrous, white, purple, or otherwise colored and strongly projecting and form the so-called "crown" or "collar" which is clearly visible even from a distance. Broad, basally fleshy (edible) involucral bracts are well known in the artichoke (*Cynara scolymus*); sometimes the involucral bracts become woody at the base. Finally, in some composites the involucral bracts (all or only some) fuse with the flowers and the achenes that are formed subsequently.

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*Henceforth, translated by the more appropriate terms, "involucral bracts" or "phyllaries."—Translators.

Usually, a considerable number of flowers are attached to the receptacle which develop centripetally: from the periphery (or base) to the center (or toward the apex) of the inflorescence. Only in rare cases of 4 extreme reduction is there a single flower in the capitulum (for example, in *Echinops*) or two flowers (for example, in the capitula with pistillate flowers, in *Ambrosia*). If the receptacle has bracts, then the flowers are borne in their axils. In appearance and structure, the flowers (flores; flosculi — "florets" according to a majority of previous authors) are quite diverse. The flowers of the composites are bisexual [or perfect], but often, after the abortion of the androecium or gynoecium, they may be unisexual or even sterile (neuter).

The diversely constructed flowers in the Compositae, which may be regular or irregular, can be reduced to the following basic types: 1) bisexual, tubular, actinomorphic (flos hermaphroditus, tubulosus, actinomorphus), often goblet-shaped in the upper part, mostly with five short teeth at the apex; 2) as the previous type but with undeveloped pistil (staminate or so-called male flowers — flos masculinus); 3) bisexual, tubular, actinomorphic or slightly zygomorphic but (in contrast with the first type) with elongated, linear or lanceolate teeth; 4) more or less similar to the previous type, but pistil and stamens reduced, as a result of which the flower is sterile or neuter (flos neuter); the flowers of this type often have well developed nectaries; 5) bisexual, bilabiate (fl. hermaphroditus, bilabiatus), with the lobe that is turned to the outside, three-toothed, and the one turned to the center more deeply two-notched or with subulate teeth; 6) more or less similar to the previous type, but stamens reduced (fl. bilabiatus, femineus); 7) pistillate or sterile, ligulate, with more or less distinct teeth at the apex or the apex entire (flos ligulatus; in Russian this type of flower is often called pseudoligulate); 8) pistillate, filiform or tubular-filiform (flos femineus, filiformis, or tubuloso-filiformis); 9) bisexual, ligulate (fl. hermaphroditus, ligulatus), with the ligule five-toothed at the apex.

All flowers in the capitulum may be of uniform structure, or several types of flowers may combine in different ways. The capitulum is termed homogamous (calathium homogamum), if all of its flowers are similar in the structure of their reproductive organs, and heterogamous (c. heterogamum), if the flowers differ in their structure (the outer flowers sterile or pistillate, but the inner ones bisexual or staminate). According to a number of authors, the capitulum is considered homogamous when all the flowers are the same (tubular, ligulate, or of other type) and only bisexual as well.

Dioecious plants are found in the Compositae comparatively rarely. In the Ambrosieae, staminate and pistillate flowers are borne in different capitula, but the plants are monoecious.

In a heterogamous capitulum the peripheral flowers are more or less clearly different in form from the central ones. Accordingly, in the capitulum one can distinguish: the center or disk (discus) almost always
5 consisting of tubular flowers, called disk flowers [or florets] (flores disci; flosculi disci; flosculi discales of early authors) and the border or rays (radius) of peripheral, ligulate flowers (more rarely of bilabiate, tubular-campanulate, and other forms) termed ray florets (flores radii; flosculi radiales of early authors). A capitulum with well developed disk and ray florets is in Latin called the calathium (capitulum) radiatum. Mostly, this term is applied just to a capitulum in which the peripheral florets (pistillate or sterile) are ligulate (more correctly — pseudoligulate), but the disk florets are tubular and bisexual.

The corolla is gamopetalous, actinomorphic, or zygomorphic, valvate in the bud stage, mostly tubular (corolla tubulosa), tubular-campanulate (c. tubulosa-campanulata), tubular-infundibular (c. tubulosa-infundibuliformis), filiform (c. filiformis), ligulate (c. ligulata; the so-called "semi-floret" — semi-flosculus of early authors), or bilabiate (c. bilabiata). Between these basic and most characteristic types of the corolla, numerous transitional forms can be observed; in certain rare cases the corolla is reduced altogether.

The color of the corolla may be yellowish-green, yellow, yellowish-white, white, pink, orange, red, blue, violet, lilac, or cornflower blue, and sometimes there are even other colors. The capitulum is called homochromous (calathium homochromum), if all its flowers have a similarly colored corolla, and heterochromous (c. heterochromum), if the corollas of its flowers differ in color (in such cases the corollas of the disk flowers are mostly yellow, but the ray flowers are of a different color).

Normally, a leafy calyx is not developed; instead, on the top of the ovary in the majority of the composites there is a special formation called the *khokholok* or pappus (*pappus*). For the *Flora of the USSR* we will use the term "*khokholok,*"* because it has long been accepted in the Russian literature on the Compositae. In general, the concept of "*khokholok*" in relation to the pappus of the composites cannot be considered entirely appropriate, because other, even genetically entirely unrelated structures are also called *khokholok*, for example, tufts of hairs on the seeds in

*Translated throughout here as "pappus." — Translators.

Salix, *Epilobium* and many Apocynaceae, the cluster of bracts in some *Polygala*, etc. We shall also mention that in the Russian botanical literature the *khokholok*, if it consists of hairs, is generally called a *letuchka*. The numerous hypotheses concerning the nature of the pappus and its relationship to the calyx can be summarized as the following basic views: 1) the pappus itself is the modified calyx; 2) the pappus is the free upper part of the calyx fused with the ovary; 3) the pappus is a trichomous and unique structure not related to the calyx (for details see the work of S.G. Tamamschjan "On the problem of the origin of pappus (*letuchka*) in the family Asteraceae (Compositae)," *Bot. Zhurnal*, Vol. XLI, No. 5, 1956; the recent of paper of Cronquist (1955) on the phylogeny of composites 6 contains quite decisive views and arguments in support of the first hypothesis). The pappus plays an important role in the dispersal of the fruits of the Compositae and, corresponding to the biological diversity of the latter, varies enormously in form and structure. The pappus may consist of individual hairs (sometimes very thin, soft, and white) or of much thicker bristles. The hairs or bristles may be simple and smooth, or (often) their developing cells (or rows of cells) produce more or less clearly distinct lateral outgrowths, as a result of which the hairs or bristles become scabrous, plumose, or branched to various degrees, but sometimes a club-shaped or brushlike thickening forms at their tip. The hairs or bristles may be free, and in that case can easily fall off individually, or they may be fused at the base into a so-called ring (annulus), and they then all usually fall together. Often the pappus is attached very firmly and generally does not fall off but remains with the fruit. In a number of cases the hairs or bristles become stiff, and then the pappus is said to be awned, but in such cases if the awns are extended in one plane more or less perpendicular to the longitudinal axis of the achene, then the pappus is said to be stellate. In quite a large number of anemochorous composites whose fruits are dispersed by air currents, like a parachute, the hairs (usually soft and plumose) constituting the pappus (the so-called *letuchka*) are clustered at the tip of the achene, which has a narrowly elongated apex (the so-called beak); such a pappus is often called a "stalked pappus," and in the case of closely related species (or genera) whose achenes do not have a beak, the pappus is termed sessile. In some species the pappus is dimorphic (for example, the peripheral flowers with an awned pappus, but the central flowers with plumose ones). In other composites, the pappus is not represented by hairs or bristles, but by scales of various forms. Sometimes pappuses are found which consist of a more or less considerable number of papery blades or scales, including petaloid ones (for example, in *Ursinia paradoxa*).

If instead of individual hairs, bristles, or scales there is a membranous fringe on the top of the ovary, then the pappus is termed coronal (in many Anthemideae); sometimes the fringe is divided into two or has the form of auricular outgrowths, or it is represented by individual or fimbriate teeth. The hairs, bristles, scales, or other structures constituting the pappus may be arranged in one series or even two or more series, and accordingly the pappus is termed uniseriate or simple, biseriate, triseriate, or multiseriate. Quite often the pappus consists of whorls of dissimilar structures; thus, for example, the outer series may be formed by scales, and the inner by bristles; or the inner row consists of a plumose whorl of hairs fused at the base, but the outer one of serrate and free bristles, etc. It is only in some (quite rare) cases that the pappus in the Compositae is totally absent.

7 The androecium in the composites almost always comprises five stamens alternating with the corolla lobes and attached by the filaments to the tube (epipetalous). In the pistillate or sterile flowers the androecium is represented by rudimentary structures or is completely reduced. The filaments of the stamens are free or, very rarely, united (Ambrosieae, *Silybum*). The morphology of the filaments, which may be pubescent or glabrous, flat or cylindrical, etc., has definite diagnostic significance. The anthers are bilocular, linear, or oblong, dehiscing inwardly (introrsely) through longitudinal slits, and are almost always united at their edges [syngenesious] into the so-called anther tube (tubus antherarum) through which the style passes; it is only in the Ambrosieae, for example, in *Iva* and *Xanthium*, that the anthers are free. They are also observed in the ray flowers of *Ligularia*. The connective of the anthers almost always forms the so-called terminal or apical appendage (appendix apicularis). Besides, quite often the sterile base of the anthers forms the so-called basal appendage (appendix basilaris); great diagnostic significance is attached to the form of the latter; it may be barely projecting or highly elongated, rounded, sagittate, with or without filiform or fimbriate tips (the so-called caudate anthers), free or united (appendages of two adjoining anthers fuse), etc.

Pollen grains in the Compositae are spherical, spherical-compressed, or ellipsoidal, generally with trisulcate-porate (less often two-, four-, or six- sulcate-porate) or triporate (Cichorioideae). The exine is mostly two-layered, with the outer being columnar, or multilayered, with several columnar layers; above the columnar layer lies a rooflike layer, most often bearing spiny outgrowths of various types; in the Cichorioideae there are special sculptured structures in the form of crests surrounding cavities (lacunae) of regular shape.

The paracarpous gynoeceum of the composites consists of two fused carpels forming one pistil. The ovary is inferior, unilocular, with one anatropous ovule (rarely two ovules), which is provided with one integument.

The style is single, filiform, at the base often spherically or bulbously enlarged, and at the apex almost always divided into two (very rarely three to five) branches. The branches of the style (rami styli) are sometimes also called stylodia. In rare cases the style branches are fused almost to the very tip, or (as in sterile flowers) the style is entire, i.e., undivided (stylus indivisus); on the contrary, in bisexual and pistillate flowers the style branches often strongly diverge and are more or less well exserted from the corolla tube. The style branches may be relatively short or long, thin or thick, mostly linear, cylindrical, flat, subulate, terete or semiterete; at the tip its branches are most often triangular or lanceolate, acuminate
8 or obtuse, sometimes truncate, in some cases dilated, inflated, or brushlike. On the outside and at the apex the style branches often have papillae or more or less dense hairs, initially appressed to the surface but later erect-spreading and forming brushlike structures. The hairs on the outside of the branches are called sweeping hairs (sometimes "collecting hairs" — pili collectores), because they facilitate the removal of pollen from the anther tube (see below). In most Cynareae there is a collar of hairs, characteristic for this group, situated at the point of thickening of the style, found near its bifurcation.

The stigma as it is usually understood is not developed in the Compositae. Its functions are performed by a special receptive (stigmatic) tissue on the inner side of the style branches. The location of the receptive (stigmatic) tissue is quite varied: it either covers the whole inner surface of the style branches from base to tip or forms two bands along the edges of the branches or one band in the middle, etc. Often the stigmatic tissue does not reach the very apex of the branches, and then the sterile tip terminating the branch is called the style appendage.

The structure of the style has important diagnostic significance. The following important types can be distinguished: 1) style uniformly cylindrical with recurved semi-cylindrical branches covered with long hairs (Cichorioideae); 2) same as the previous one, but the branches not recurved, with thin hairs on the outside; the receptive tissue does not reach beyond the middle of the lobes (*Petasites, Eupatorium*, and others); 3) style swollen at the point of branching and densely covered with long hairs at the point of swelling (Centaureae and others); 4) branches elongated or linear, flat on the outside and densely pilose in the upper part; the receptive tissue extends up to the point where the branches are covered with hairs on the outside (some Astereae, Inuleae, and others); 5) branches at the apex brushlike (of long hairs); wide bands of receptive tissue extend to the point of the brushlike pubescence (*Artemisia, Gnaphalium*, and others).

In the majority of the composites the base of the style becomes a more or less well developed nectariferous disk. Bower distinguishes in a number of composites the so-called stylopodium, an enlarged part of the base the style, and the stylophore (stylophorum), the narrow part of the style situated below the stylopodium.

Pollination in the composites is brought about, as a rule, with the help of insects, but certain genera (including the large genus *Artemisia*) are anemophilous. Protandry is observed in almost all the Compositae. The filaments of the stamens of many genera have great sensitivity, capable of contracting movements. In this case the anther tube drops sharply, brushing against the style with the sweeping hairs, pushing the pollen upward to the tip of the anther tube. In the composite species that
9 do not have anther filaments capable of contraction, the pollen is carried upward by the growing style. Self-pollination is observed comparatively rarely in the Compositae, but on the other hand apomictic forms are often encountered.

The fruit of the composites, classified an achene (achaenium; also achenium, achaena; achena; less often, especially in older works, akenium and akena; semen — in Linnaeus and some of his followers), is unilocular, monospermous, indehiscent, as a rule dry (rarely somewhat fleshy), and most often crowned with a pappus. From the viewpoint of modern morphology, the achene in the Compositae is an inferior paracarpic fruit (i.e., developing from the paracarpous ovary) formed from two carpels. The achene wall or pericarp (pericarpium) and seed coat (testa) are appressed to each other, but fused incompletely or not at all. As a rule, in the mature seed, usually oil-rich, one sees neither endosperm nor perisperm. The embryo is straight, with a short and downwardly pointed primary radicle and with two flat, semicylindrical, sometimes contorted (coiled) cotyledons; as an exception, in the species of *Syneilesis*, only one cotyledon is found. The form of the achene is extremely variable; most often it is oblong, terete, obpyramidal, more or less compressed, with pronounced angles or ribs, with or without winged processes, etc. Externally, the achene is either devoid of pubescence or pilose, villous-pilose, scabrous, sticky, etc.; the surface may similarly be wrinkled, tuberculate, ridged, scaly, etc. In some Anthemideae the achenes are equipped with the so-called myxogenic (mucilaginous) cells, probably facilitating the dispersal as well as the germination of the fruits under arid conditions. In the center of the upper part of the achene (on its apical area) a trace of the style base often is evident, projecting in the form of a rod, stub, cone, etc. In other cases (in many representatives of the Cichorioideae) the tip of the achene may be extended into the so-called beak (rostrum) and accordingly achenes with a beak (achaenium rostratum) and achenes without a beak (achaenium erostratum, a. erostre) can be distinguished. In *Taraxacum* the achene before passing into the beak is elongated into the so-called pyramid (pyramis). On the edges of the apical area of the achene a round bead, almost always shining and of a different color than the surface of the fruit, is often observed; many botanists consider this bead as a vestige of the calyx. In other cases the tip of the achene is provided with a special toothed peristome (for example, in *Saussurea*) or with a crown of hairs (for example, in *Gnaphalium supinum*); the development of such structures apparently has a genetic link with the pappus. The achenes are attached to the receptacle by their bases, close to which there may also be a bead; the basal area of the achene, called the place of attachment (areola; in a number of the works so-called scar—hilum) is either more or less flat or hollowed or, on the contrary, domed; in many composites it is situated, not symmetrically, 10 but obliquely or at the base of the inner side of the achene. Sometimes (in some Anthemideae) the achenes are stalked; still more rarely (Echinopsidinae) each achene is enclosed in its own involucre (achaenium involucratum), and in the Ambrosieae at the time of fruit development the involucre enlarges and hardens, enclosing the two achenes in their own locules. The phenomenon of the heterocarpy (formation of more or less different types of fruits in the same capitulum) observed in many composites is linked either with heteranthy of the capitulum (presence of flowers of different structure) or simply with the topography of the achenes (peripheral achenes are more or less markedly different form achenes closer to the center of the capitulum). In the mature capitulum each individual fruit usually detaches freely from the receptacle. More rarely, the compound fruit as a whole serves the purpose of dissemination (as in *Arctium*) or the fruit detaches along with the adhering involucral bracts (*Siegesbackia*).

Leaf arrangement is mostly alternate, less often opposite or whorled, or the leaves are in basal rosettes. The leaves often are variously dissected, exstipulate, but sometimes have expanded stipulelike appendages at the base of the petiole. In many composites the leaves are stiff as well as "armed," i.e., provided with more or less hard and well developed prickles or needlelike structures. Decurrent leaves are also found in the Compositae. The type of venation is pinnate, in rare cases (for example, in *Scorzonera*) camptodromous.

The Compositae are annuals or biennials, but more often perennial herbs and sub-shrubs with simple or branched, sometimes winged, frequently (mostly at the base) woody stems; however, acaulescence is characteristic of a considerable number of species. Rarely are small shrubs encountered in the temperate latitudes, whereas in the tropics and subtropics there also are lianas, tall shrubs, and arborescent forms.

Rhizomes are comparatively rare in the Compositae, but sometimes they develop vigorously; in certain cases the rhizomes are nodularly or tuberously thickened.

The root is simple and fusiform or branched, often woody and many-headed; frequently the roots are ropelike, sometimes tuberous (as for example, in *Dahlia*). In many composites (particularly weedy species) the roots develop vigorously, often are arranged in several layers in the soil, and develop adventitious buds.

The presence of a so-called caudex is characteristic of a considerable number of Compositae, particularly for those of the semidesert and desert zones.

Composites are often covered with thin, soft hairs or quite coarse bristles, stellate hairs, glands, etc. Of late considerable diagnostic signifi-
11 cance is attached to the nature of the vestiture in the Compositae, because frequently it becomes possible to show that one or another type of hairs is specific to a certain taxonomically related group of plants. Thick tomentose pubescence is characteristic of many xerophytic as well as alpine composites.

Among anatomical features mention must be made of the presence of jointed laticifers, which are found in the whole subfamily Cichorioideae, as well as in a few representatives of other subfamilies. In the composites the latex often contains the rubber hydrocarbon caoutchouc (but in certain genera, such as *Parthenium*, the rubber is not found in lacticifers). In the subfamily Carduoideae, conceptacles are often found (in the form of short cells or long ducts) with an essential oil or resin.

Starch is absent; instead, there is the reserve carbohydrate, inulin. A number of composite contains alkaloids, glucosides, and coumarin.

Members of the family Compositae are extensively found throughout the world. They grow in the most diverse geographical and ecological conditions: in the arctic, forest, forest-steppe, steppe, semidesert and desert, subtropical and tropical zones; on the plains and high in the mountains; on vast continents and isolated islands; in shady places and on slopes strongly exposed to the sun; on saline soils and in wetlands, etc., etc. Among the composites we find pronounced xerophytes, mesophytes, psychrophytes, halophytes, and other ecological types, as well as all possible intermediates between them. Only parasitic, saprophytic, and purely hydrophytic forms are extremely rare in this family. Besides sexual and apomictic reproduction, among the composites we find different, often very highly developed forms of vegetative reproduction (as a result of which some members of this family have become troublesome weeds). In some, as in sow-thistles, rapid vegetative reproduction is ensured by adventitious buds; in others, through the formation of tubers on the rhizome (in *Helianthus tuberosus* they are edible); in a third group (for example, in *Bellis*), by stolons; in a fourth group, by creeping runners (in some *Achillea*), etc. Instances of apogamy and apospory also are frequent in the Compositae.

The achenes of composites are provided, as a rule, with perfect adaptations for dispersal by wind, animals, or other agents (for details see the book by R.E. Levin: *Sposoby Rasprostraneniya Plodov i Semyan* [Modes of Dispersal of Fruits and Seeds], Moscow Univ. Press., 1957). The number of achenes produced annually by a single plant of this family usually is large, sometimes really colossal (for example, a single plant of the annual weed *Erigeron canadensis*, of American origin, can produce more than 100,000 achenes). As a result, many composites are 12 capable of spreading to new territories quickly. In his time, Charles Darwin, who, in his *Origin of Species* in the chapter on colonization of new territories by plants, cited two species of composites as examples, drew attention to this. With regard to invasion of new areas, by composites, the well recorded spread in our country of the North American matricary, *Matricaria matricarioides*, is interesting. One well developed individual of this plant produces approximately 5,000 achenes. In the 1840s, the American matricary was cultivated as a rare plant in the Petersburg Botanic Garden; in the 1860s it appeared in the outskirts of the present Leningrad then in the Moscow (1887), Gorky (1898), and Perm (1912) provinces, in the Altai (1927), etc. Within approximately 100 years the American matricary had become an extremely common weed, found almost everywhere in most provinces of the European part of the USSR, as well as in many regions of Siberia and the Far East and in Soviet Central Asia.

The role of composites in the composition of the plant cover of the USSR is not uniform. It is comparatively insignificant in the arctic zone and of secondary importance in the taiga, conifer-broad-leaf, and broadleaf zones; however, already in the forest-steppes contribution of composites increase significantly, and still farther south in the steppe region and particularly in the deserts and semideserts, numerous wormwoods and other Compositae often are the plants that determine the general aspect of the landscape continuously over hundreds of kilometers (for further details about the phytocoenotic role of composites, see the article by E.M. Lavrenko "Ob izuchenii edifikatorov rastitel'nogo pokrova" [On the Study of the *edificators* of the Vegetation Cover], *Sov. Bot.*, XV, 1, 1947.

Heteranthy, heterocarpy, stenotopy (living on very particular, often quite specific substrates having limited occurrence), stenochory (restricted to very narrow areas), a diversity of biological adaptations (for pollination, vegetative reproduction, withstanding unfavourable conditions, dispersal of achenes, etc.), and the presence of a considerable number of species having an important relationship to the practical activity of man make the composite family extraordinarily interesting for comprehensive study from the scientific and practical points of views.

The family comprises about 1,000 genera and 25,000–30,000 species (not considering an approximately equal number of apomictic species, particularly in the genera *Hieracium* and *Taraxacum*). There are many polytypic genera (in one genus alone, *Senecio* L. s.l., there are more than 2,300–2,500 species throughout the world), but along with them there are a great many oligotypic and monotypic genera as well. In most countries composites constitute a considerable percentage of the flora (in the flora of the Caucasus about 13%, Soviet Central Asia about 15%, the Balkan and Pyrenee peninsulas about 14%, and so on). The greatest diversity of the Compositae is observed in the steppe regions of North and South America. The Compositae are also represented in the Arctic and in the Humid Tropics, as a comparatively small percentage of the flora.

In the unanimous opinion of researchers, the composites are one of 13 the most natural and at the same time evolutionarily advanced groups of plants. Nevertheless, until now there is no consensus of opinion about the position of the Compositae in the general classification of the angiosperms. There are at least three main points of view: 1) the origin of Compositae is linked with Campanulatae; 2) the Compositae are closest to the Rubiales; 3) the Compositae are closely related to the Umbelliflorae. Besides, inferences have also been drawn regarding the phylogenetic relationship of the composites with the Dipsacaceae, parallel development of the Compositae and the Papaveraceae, the polyphyletic origin of the composites, and others.

The taxonomy of the composites is far from being worked out. Although even a beginning botanist can correctly determine whether a plant belongs to the Compositae, grouping the species of this family into natural genera, subtribes, and tribes is indeed extremely difficult, and attempts to establish phylogenetic relationships between them present extraordinary difficulties even for the most highly qualified specialists. This fact, as well as the huge size of the Compositae, which, in terms of number of species and genera, includes about 10% of the total higher-plant flora of the world, create serious obstacles for the phylogenetic classification of the family as a whole. Repeatedly, efforts have been made to split the Compositae into a number (from 2 to 14) of separate families, but such attempts at family inflation are negated by numerous data compelling one to consider the composites as a monolithic group.

In the 19th century the prominent experts on the Compositae (Cassini, Lessing, De Candolle, Baillon, Hoffmann) tried to construct a classification of the family. In the light of modern evidence their views need considerable modification.

In the "*Flora of the USSR*" the system of O. Hoffmann (1889–1894) has been adopted. As is well known, his views have been subjected repeatedly to serious criticism, in our country as well as abroad. However, at present there still is no other generally accepted classification of the Compositae as a whole that has been worked out in such detail as Hoffmann's. Considering the significant progress in the study of the composites during the past 50 years, one can only hope that in the not-too-distant future it will be possible to judge more reliably concerning the true interrelationships of the genera of the Compositae (for the literature on this question, see the well known summary of J. Small, *The Origin and Development of the Compositae*, London, 1919; for more recent data, cf. the fundamental works of G.l. Stebbins, A new classification of the tribe Cichorieae, family Compositae, *Madrono*, Vol. 12, 3, 1953, and A. Cronquist, A phylogeny and taxonomy of the Compositae, *Amer. Midl. Nat.*, Vol. 53, 2, 1955).

KEY TO SUBFAMILIES

1. All flowers in capitulum ligulate; ligules 5-toothed at apex; plants usually with latex found in well developed system of anastomosing laticifers..............................Subfamily II. **Cichorioideae** Kitam.

14 + All flowers in capitulum tubular (tubular-infundibuliform, tubular-filiform, tubular-campanulate, etc.) or bilabiate; ligulate flowers either absent altogether or absent at least in central part (disk) of capitulum; if present, corolla generally 3-toothed at apex or teeth indistinct. Plants almost always without latex, but if present, latex found in isolated cells or conceptacles (with exception of genus *Gundelia*)..........................Subfamily I. **Carduoideae** Kitam.

SUBFAMILY I. **CARDUOIDEAE** Kitam. in Mem. Coll. Sc. Kyoto Imp. Univ., Ser. B, Vol. XII (1937) 5 (Comp. Jap. I).—Tubuliflorae DC. Prodr. V (1836) 8.—Characterists are given in the key to the subfamilies.

KEY TO TRIBES OF SUBFAMILY CARDUOIDEAE

1. All flowers in capitulum with bilabiate corolla...Tribe 13. **Mutisieae** Cass.

+ All flowers in capitulum tubular or only central (disk) florets tubular, but outer ones (peripheral or so-called ray florets) ligulate; sometimes peripheral flowers with undeveloped stamens and pistils (so-called neutral or sterile flowers) and somewhat irregular bilabiate corolla..2

2. Style below point of branching with crown (collar) of pollen-sweeping hairs or at least with thickening..3

+ Style below point of branching without crown (collar) of pollen-sweeping hairs and not thickened..5

3. Receptacle covered with paleae [chaffy scales], which after fusing with each other and with the involucral bracts, form chambers enclosing the florets. Plants (within USSR) with latex, coarse and spiny..Tribe 10. **Arctotideae** Cass.

+ Receptacle, if chaffy, then paleae neither fuse with each other nor with involucral bracts. Plants without latex..4

4. Each individual capitulum with only one floret; capitula arranged in a spherical or oval head.......Tribe 12. **Echinophsideae** Cass.

+ Each individual capitulum with a few or (often) many florets..Tribe 11. **Cynareae** Less.

5 (2). Achenes curved, at least outer ones with distinct spine-like outgrowths or toothed (less often tuberculate) on back side, sometimes at apex with two small horns or with short, radially situated, spinelike outgrowths; mature achenes mainly stellate-spreading; the inner ones, as a rule, differ noticeably (at least in size) from the outer ones...............................Tribe 9. **Calenduleae** Cass.

15 + Achenes not curved or without spinelike outgrowths or teeth on the back..6

6. Anthers, as a rule, sagittate at base or with finely attenuated, filiform processes (so-called “tails”); peripheral ligulate flowers often absent...Tribe 3. **Inuleae** Cass.

+ Anthers obtuse or acute at base, only sometimes almost sagittate, peripheral ligulate flowers generally present...................................7

7. Bands of receptive stigmatic tissue not extending to tip of style branches (located at base of branches or below middle of branching); style branches generally more or less clavate, pubescent all around with short, often papillate hairs; florets not purely yellow; ligulate florets absent............................Tribe 1. **Eupatorieae** Cass.

+ Bands of receptive stigmatic tissue extending to tip of style branches, these generally acute or acuminate (less often obtuse, but then hairy); flowers (at least disk florets) generally yellow; ligulate florets generally present..8

8. Anthers free or if fused, then only at base; pappus absent or rudimentary; ligulate florets absent. Plants often monoecious ....Tribe 5. **Ambrosieae** Cass.

+ Anthers fused into so-called anther tube through which style passes; pappus and ligulate florets generally present. Plants rarely monoecious...9

9. Style branches (in well developed perfect flowers) flat; a sterile part (so-called appendage), covered on the outside with hairs, usually persists above the bands of receptive tissue; branches glabrous on inner side, never with ring of long hairs; receptacle naked...Tribe 2. **Astereae** Cass.

+ Style branches (in well developed perfect flowers) with tuft of long hairs at apex; appendage, if present above bands of receptive stigmatic tissue, covered with long hairs on inner as well as outer sides or ring of hairs below appendage; receptacle often chaffy..10

10. Pappus of numerous hairlike bristles; receptacle naked, mostly glabrous; involucral bracts either in one row, mostly of equal length, or in two rose, but not imbricately arranged and second, outer row of bracts smaller than inner ones...Tribe 8. **Senecioneae** Cass.

+ Pappus of hairlike bristles absent or if present (rarely!), then receptacle chaffy; involucral bracts mostly in two or more rows, often overlapping..11

11. Involucral bracts with scarious margin, usually coriaceous; pappus absent or present in form of short crown...Tribe 7. **Anthemideae** Cass. 16

+ Involucral bracts without scarious margin, often herbaceous or foliaceous; pappus, for the most part present..............................12

12. Receptacle chaffy..................................Tribe 4. **Heliantheae** Cass.

+ Receptacle not chaffy (naked, fimbriate, or hairy)..Tribe 6. **Helenieae** Cass.

Tribe 1. **EUPATORIEAE** Cass. in Bull. Soc. Philom. Paris (1815) 173 and in Dict. Sc. Nat. XVI (1820) 9, XX (1821) 383; XXVI (1823) 227, LX (1830) 585; O. Hoffm. in Pflanzenfam. IV, 5 (1889-1894) 131.—Eupatoriaceae Link. Handb. I (1829) 729; Less. Synops. Comp. (1832) 154; DC. Prodr. V (1836) 103; Benth. in Benth. and Hook. f. Gen. Pl. II (1873) 171. — Capitulum homogamous. All flowers tubular, bisexual and fertile. Receptacle naked or alveolate, sometimes with a few deciduous scales between flowers. Anther at base round or obtuse, entire, very rarely (in a few species of exotic genera!) more or less sagittate. Style branches semicylindrical, less often cylindrical or clavate, glabrous or covered with short papillae. Corolla never pure yellow. Leaves mostly whorled (two or more leaves at node) or, less often, alternate.

Herbs or shrubs (in tropics arborescent forms as well); majority of species found in temperate and tropical regions of America.

KEY TO GENERA OF EUPATORIEAE[1]

1. Plants with very large (up to 50 cm wide), entire, cordate, rounded basal leaves. Cauline leaves few or totally absent, or upper leaves greatly reduced in size. Pappus of two to three rows of simple hairs...1453. **Adenostyles** Cass.

+ Leaves smaller in size and usually of different shape: ovate, triangularly-ovate, elliptical or linear, mostly opposite, less often spiral..2

2. Capitulum many-flowered, globose. Pappus in form of crown or of membranous, glabrous or ciliate bristles.............***Ageratum** L.

+ Capitulum four- to eight-flowered, more or less cylindrical. Pappus of one row of hairs or several membranous scales of various forms..3

3. Capitula aggregated in long, spicate or narrowly racemose inflorescences. Style branches long-exserted. Achenes 10-ribbed. Pappus in one row of downy or bristly hairs......................***Liatris** L.

17 + Capitula in corymb or in clusters or cymes at the tips of a compound paniculate inflorence..4

4. Involucre foliaceous, cylindrical, of five narrow, herbaceous, one-rowed bracts. Capitula in compound panicles...........***Stevia** Cav.

+ Involucral bracts imbricate, many-rowed. Small capitula oblong, in dense corymb..1452. **Eupatorium** L.

Subtribe 1. **AGERATINAE** O. Hoffm. in Pflanzenfam. IV, 5 (1889-1894) 133. —Anthers with apical appendages. Achenes angular with three to five prominent ribs; secondary ribs usually inconspicuous.

GENUS ***Ageratum** L. [1,2]

L. Sp. pl. (1753) 839; Robinson in Proc. Amer. Acad. XLIX (1913) 438

Capitula homogamous, with many flowers, spherical, with nonligulate bisexual flowers. Involucre one-to three-rowed of almost uniform, linear, acuminate, herbaceous bracts. Receptacle flat or convex, glabrous or lamellar. Anther round at base. Achene slightly angular, often slightly tapering and truncate downward, smooth or tuberculate, with bristles; hilum at base surrounded by annular white process. Pappus of fused or free scarious bristles, glabrous along margin or ciliate, sometimes in form of corona. Perennial herbs and semishrubs mostly with opposite leaves.

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[1] Treatment by S.G. Tamamschjan.

[2] From the Greek word *ageratos*—not ageing, because the plant retains its fresh appearance for a long time.

Of approximately 30 species found mostly in North and Central America and eastern, India, We have one.

1. **A. houstonianum** Mill. Gard. Dict. Ed. 8 (1768) No. 2.—*A. obtusifolium* Lam. Encycl. Meth. I (1778) 54.

Perennial. Stem erect or ascending, branched, pubescent with erect hairs, leaves petiolate, broadly-triangular, cordate at base, undivided, serrate or dentate, pilose. Capitulum 8–10 mm wide, in compact corymb; involucral bracts linearly lanceolate, gradually attenuate into cusp, pilose, often colored; corolla sky-blue; pappus of five laminate scales, fimbriate-ciliate. Flowering IX–XI.

Grown in gardens as border plant. Described from Mexico.

18 GENUS ***Stevia** Cav. [1, 2]

Cav. Icones et Deser. Pl. IV (1797) 32; Robinson in Contrib. Gray. Herb. XC (1930) 36

Capitulum small, homogamous, with small number of flowers, in racemes or at tip in clusters. Involucre cylindrical, of five narrow one-whorled bracts. Receptacle glabrous. Florets five, tubular, bisexual. Anther obtuse at base, entire. Achenes long, narrow, with four or five ribs, sometimes with additional secondary one or two ribs. Pappus of two or many scales of various shape, fused or free, sometimes reduced. Perennial herbs or semishrubs with opposite, spiral, or mixed leaf arrangement.

Of the 300 species spread over North and South America, we have one.

1. **S. ovata** Willd. Enum. Hort. Berol. (1809) 855; Horenm. Hort. Hafn. II (1815) 793; Lag. Gen. et Spec. Nov. (1816) 27; Rchb. Ic. Bot. Exot. II (1828) t. 184; Robinson ibid. —*S. paniculata* Lag. op. cit. Kolakovskii in Flora Abkh. IV (1949) 191. —*S. hyssopifolia* Sims, Bot. Mag. (1817) t. 185. —*Ic.*: Sims, Ibid, t. 185.

Perennial. Root fibrous; stem erect, reddish, almost glabrous; leaves opposite or, particularly at tip, alternate, ovate to rhomboidal and lanceolate; lower petiolate, upper sessile or almost sessile, obtuse or acuminate, truncated below, often with three to seven teeth along both sides above middle, membranous or succulent, dotted with glands, much brighter ventrally, three-veined, 3.0–4.5 cm long and 1–2 cm wide. Capitula in

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[1] Treatment by S.G. Tamamschjan.

[2] In honor of the 16th-century Spanish doctor Esteve.

panicles, with peduncles up to 1 cm long; involucral bracts green, acuminate, with decumbent hairs and punctiform glands; corolla white; achenes heteromorphic, all covered with short scales, but usually only two or three mature. Flowering X–XII.

Introduced, infesting lawns in shade. —*Caucasus*: Sukhumi. *General distribution*: North America. Described from Mexico. Type in London.

GENUS 1452. **Eupatorium** L. [1, 2]

L. Sp. pl. (1753) 836

Capitula campanulate, with three to seven florets in compound corymbs; involucral bracts 7–12, imbricate, in two or three rows; outer ones ovate, slightly pubescent; inner ones lanceolate, membranous, gla- 19 brous; receptacles flat or somewhat convex, glabrous; all flowers infundibuliform, bisexual, dirty pink, lilac-pink, or white; anther round at base; style bifurcated; style branches long, greatly exserted from corona, filiform, semicylindrical, obtuse or subobtuse, somewhat plumose. Achenes oblong, dark gray with five rather thick ribs (edges), glabrous or slightly glandular, truncate at apex, shorter than pappus; pappus one-rowed, of long, scabrous, barbate, persistent, free hairs. Perennial herbs with simple and erect or branched stems. Leaves opposite, ternate or undivided, less often whorled.

Type species: *E. hyssopifolium* L.

This genus includes several hundred species distributed mostly in the western hemisphere; there are a few species in tropical Africa and in Asia.

Achenes of *E. cannabinum* L. are known in fossil form in the Pliocene deposits of the Samara bend (P.I. Dorofeev) and in the Riss-Würm deposits of Smolenshchina and Belorussia (P.I. Dorofeev). —*E.* sp. (cf. *E. cannabinum* L.) in the Pliocene of the Upper Don in Voronezh Province (P.A. Nikitin). —*E.* sp. in the Pliocene of the Lower Kama (P.I. Dorofeev).

1. Leaves simple, in whorls of three or four..3. **E. glehnii** Fr. Schmidt

+ Leaves ternate, at least only lower ones, opposite; sometimes upper leaves ternate, sessile; opposite leaves as if in whorls of six..2

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[1] Treatment by N.L. Tsvetkova.

[2] The name originates from the Pontic King Mithradates Eupator (II-I centuries BC).

2. Stem branched; upper leaves ternate, less often simple, petiolate, opposite..1. **E. cannabinum** L.

+ Stem simple; upper leaves ternate, sessile, hence appearing not opposite, but in whorls of six...................2. **E. lindleyanum** DC.

1. **E. cannabinum** L. Sp. pl. (1753) 838; Ldb. Fl. Ross. II, 465; Boiss. Fl. or. III, 154; O. and B. Fedtsch. Perech. Rast. Turk. IV, 11; Grossh. Fl. Kavk. Izd. 1, IV, 90; Majevski, Fl., Izd. 8, 562. —*E. syriacum* Jacq. Misc. austriaca II (1781) 349. —*E. caucasic.um* Stev. in Bull. Soc. Nat. Mosc. 39 (1856) 371. —*E. hyrcanicum* Stev. in Bull. Soc. Nat. Mosc. IV (1856) 371. —**Ic.**: Jacq. Icon. pl. rarior. I, tab. 170; Majevski op. cit. Fig. 208. —**Exs.**: GRF No. 22.

Perennial. Rhizome thick, nodular, with numerous slender roots; stem up to 1.5 m high, erect, simple, branching opposite, slightly sulcate, sometimes lilac-pink, like leaves with slightly curled pubescence, less often glabrous with shining glands. Leaves opposite, short-petiolate; lower leaves usually palmate with three lanceolate lobes, long acuminate, sharply and not uniformly uncinately serrate, surface smooth and not with prominent veins; middle lobes of leaf up to 15 cm long and 3–4 cm wide, often longer and broader than lateral lobes, sometimes lobes of leaf much 20 broader, shorter and obtuse (almost rhomboidal), wrinkled, with prominent veins and rather large, obtuse teeth along margin; upper leaves less often undivided or entire. Inflorescence compound, many-headed, compact, apical corymb; capitulum 8–10 mm long with 3–7 florets; involucre two- or three-rowed, imbricate, campanulate, slightly shorter than flowers, consisting of nine or ten bracts; outer bracts ovate, pubescent, inner ones lanceolate, glabrous, along margin membranous, pinkish at tip; corolla dirty pink, infundibuliform, with five small and acute teeth; style branches 2–3 mm long; achenes oblong, four- or five-angled, truncate at apex, narrowed downward, dark gray, punctately glandular, 2–3 mm long and about 1 mm wide; pappus white, one-rowed, with scabrous, serrate hairs, 3–5 mm long. Flowering VI–IX.

Low, swampy and shady places, meadows, along banks of rivers and streams. —*European Part*: Baltic Republics, Ladoga-Ilmen, Upper Volga, Volga-Kama, Upper Dnieper, Middle Dnieper, Volga-Don, Trans-Volga, Upper Dniester, Bessarabia, Black Sea Region; Crimea, Lower Don, Lower Volga; *Caucasus*: All regions; *Soviet Central Asia*: mountainous Turkmenia. *General distribution:* Canada, Central Europe, Atlantic Europe, Mediterranean (except Africa), Balkans-Asia Minor, Armenia and Kurdistan, Iran. Described from West Europe. Type in London.

Note. In the USSR, throughout the geographic area of the species, particularly in its southern part, rarely do we find plants with simple, not tripinnate, leaves; sometimes only the middle cauline leaves are simple.

Such plants are treated as a separate form, viz. f. *indivisum* DC. In Crimea, the Caucasus, and in Kopet-Dag, along with the usual form quite often we find plants of *E. cannabinum* L. in which the leaves, particularly the upper ones, are glabrous and with an entire margin. There, but mostly in the Caucasus, plants are found with dense rather stiff, pubescence and broad, almost rhomboidal leaf lobes, with large obtuse teeth along the margin, whereas usually *E. cannabinum* L. has less manifest pubescence and its leaf lobes are lanceolate with a quite long attenuated apex and fine acute teeth along the margin. However, all these forms are not very distinct in nature and must be considered within the limits of the same species, *E. cannabinum* L.

Economic Importance. In folk medicine, it is used against dropsy and other ailments. Leaves and roots were used as raw material for the preparation of black and blue dyes. The stems of the plants yield a coarse fiber.

2. **E. lindleyanum** DC. Prodr. V (1836) 180; Kitamura in Mem. Coll. Sc. Kyoto Univ., ser. B, XIII, 287. —*E. kirilovii* Turcz. in Bull. Soc. Nat. Mosc. VII (1837) 153; Maxim. Prim. fl. amur. 143; Kom. and Alis. Opredel. Rast. Dalnevost. Kr. II, 1009. —**Ic.**: Gartenfl. XXVI, tab. 850.

Perennial. Rhizome thick, with numerous slender roots; stems erect, simple, branched only in inflorescence, 30–80 cm high, somewhat angular, almost glabrous in lower part, but pubescent with many-celled curly
21 hairs toward tip. Leaves opposite, ternate; lower leaves short-petiolate, upper ones almost sessile such that lobes of each pair of opposite leaves resemble six-leaved whorl; leaf lobes oblong or lanceolate, acute, cuneate toward base, with glands, pubescent dorsally along veins, sparsely pubescent ventrally with few, acute teeth along margin. Inflorescence compound terminal corymb; highly compressed in typical form, almost hemispherical, 3–4 cm wide, in more highly developed specimens up to 10–12 cm; its branches densely pubescent, bright crimson or violet; capitula campanulate, 7 mm long, with five to seven florets; involucres two- or three-rowed, imbricate; involucral bracts 10–12, oblong-lanceolate, acute, membranous along margins, outer ones very small, somewhat pubescent, inner ones 6–7 mm long, glabrous, bright pink (sometimes white) almost up to half, green toward base; florets infundibuliform with five teeth, 4–5 mm long, lilac in lower part, bright pink or white in upper part; style branches 2–3 mm long, bright pink. Achenes oblong, four- or five-angled, slightly narrowed below, 2.0–2.5 mm long, about 1 mm wide, glandular, dark brown or black; pappus one-rowed, white; hairs serrate, 4 mm long. Flowering VII–IX.

In wet, mountain meadows and in river bank shrubby thickets. —*Far East*: Zeya-Burya, Ussuri. *General distribution*: Japan, China. Described from China. Type in Cambridge (England).

3. **E. glehnii** Fr. Schmidt ex Trautv. in Tr. Peterb. Bot. Sada, VIII, 2 (1883) 432 —*E. japonicum* Thunb. var. *sachalinense* Fr. Schmidt in Mém. Acad. Sc., St.-Pétersb. sér. VII, t. XII, No. 2 (1868) 145. —*E. sachalinense* Makino in Bot. Magaz. Tokyo XXIII (1909) 90. —*E. chinense* L. subsp. *sachalinense* Kitamura in Mem. Coll. Sc. Univ. Kyoto, ser. B, t. XXIV, No. 1 (1957) 50.—**Exs.**: G. Fl. SSSR, No. 3899 (sub *E. sachalinense* Makino). —**Ic.**: Sugawara, Ill. Fl. Saghalien, IV, tab. 806 (sub *E. sachalinense* Makino).

Perennial. Rhizome woody, with few slender roots; stems 30 cm to 1 m high, somewhat erect, simple, branched only in inflorescence, pubescent in upper part, glabrous at base, slightly sulcate. Leaves simple, whorled, three or four in each whorl, short-petiolate or sessile, lanceolately oblong, acuminate, somewhat cuneate at base, sharply serrate, sometimes doubly serrate; ventrally green, curly pubescent, dorsally glandular, somewhat pubescent along veins or glabrous, 10–15 cm long, 3–4 cm wide; upper leaves considerably smaller. Inflorescence compound terminal corymb, 8–10 cm wide. Capitula with five or six florets, glandular, infundibuliform. Involucres loosely imbricate, two- or three-rowed, involucral bracts 8–12, oblong, obtuse, with membranous margin, sometimes reddish, outer ones somewhat pubescent or glabrous, 2–3 mm long, inner ones glabrous, 5–7 mm long; corolla infundibuliform with five small teeth, lilac-pink, 4 mm long; style branches 3 mm long; pappus 4 mm long, one-rowed, white, pappus hairs serrate; achenes oblong, 3 mm 22 long, 1 mm wide, dark brown, four- or five-angled, truncate at tip and tapering below, glandular. Flowering VII–IX.

Among shrubs and in forest glades. —*Far East*: Sakhalin (South Sakhalin and Kuril Islands). *General distribution*: Japan. Described from Sakhalin Island (Uro Valley). Type in Leningrad.

Subtribe 2. **ADENOSTYLINAE** O. Hoffm. in Pflanzenfam. IV, 5 (1889–1894) 140. —Anthers with apical appendages. Achenes angular with 8–10 primary ribs; secondary ribs more or less distinct between primary ribs.

GENUS 1453. **Adenostyles** Cass. [1,2]

Cass. Diction. Sc. nat. I (1826) 59

Capitula narrowly cylindrical, usually with few florets (3–30 florets) in umbellate racemose inflorescence. Involucral bracts few, outer ones in form of small scales. All florets tubular, uniform, with five-toothed corolla. Filaments of stamens decurrent downward; anther obtuse at base. Style branches semicylindrical, tip obtuse, not thickened below. Pappus of two or three rows of simple hairs. Achenes oblong, 10-angled. Perennial; tall plants with alternate, entire, roundish-cordate, often serrate, large leaves.

Of the four to five species growing in the mountains of Europe and Asia Minor, we have one.

1. **A. alliariae** (Gouan) Kern. in Öst. Bot. Zeitschr. 21 (1871) 12. — *A. albida* Cass. in Bull. Soc. Phylom. (1816) 20. —*A. albifrons* Rchb. Fl. germ. exc. (1832) 278. — *Cacalia alliariae* Gouan, Illustrat. (1773) 65. —*C. tomentosa* Jacq. Hort. Vind. III (1775) 20. — *C. albifrons* L. fil. Supply. (1781) 353. —**Ic.**: Hegi, Ill. Fl. VI. 405.

Perennial. Root nodose, covered with fibrous remnants of previous year's leaves; stem up to 150 (200) cm high, erect, branched forkwise, glabrous or sometimes flocculently pubescent. Leaves large, orbicular or triangularly cordate, often short acuminate, and unevenly sharply serrate; lamina dull green ventrally but coarse-webbed dorsally, less often glabrous, with distinct venation; lower leaves very large, up to 50 cm wide, cauline leaves few or totally absent, upper leaves much smaller, usually sessile and amplexicaul, less often petiolate, and sometimes bearing pair of auricles at base. Capitulum narrowly cylindrical, with three or four
23 florets; involucral bracts long, acuminate, glabrous, violet-green, often tinged purple; corolla bright pink, sometimes white, with lobes as long as tube. Achenes small, up to 3 mm long; pappus of white, soft, slightly wavy hairs, longer than achene. Flowering VII–IX.

Subalpine meadows, mountain meadows, and beech forests on slopes. —*European Part*: Upper Dniester. *General distribution*: North Europe. Described from Austria. Type in Paris?

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[1] Treatment by S.G. Tamamschjan.

[2] From the Greek words *aden*—gland and *stylos*—style; the style is covered with warty glands.

GENUS **Liatris** Schreb. [1, 2]

Schreb. Gener. (1791) 542. —*Laciniaria* Hill. Veg. Syst. IV (1762) 49. —*Pilosanthus* Neck. Elem. (1790) 69

Capitula oblong, sometimes narrow, with many florets, in long spicate or racemose inflorescences. Involucral bracts four- to six- to many-rowed, imbricate, herbaceous. Receptacle bare. All florets alike, tubular, bisexual. Anthers without apical appendages, at base entire, obtuse. Styles long-cylindrical, exserted far beyond corolla. Achenes uniform, cylindrical, ribbed, ribs about 10. Pappus one-rowed, bristles hairy. Perennial herbs with tuberous root; stem usually simple. Leaves undivided, alternate.

Of the more than 20 species found in North America, we have one.

1. **L. spicata** (L.) Willd. Sp. pl. III, 3 (1804) 1637. —*L. sessiliflora* Bertol. Misc. Bot. 10 (1846) t. 2, 11. —*L. macrostachya* Mich. Fl. Bor.-Amer. II (1803) 91. —*Serratula spicata* L. Sp. pl. (1762) 1147. —*Spurago spicata* Gaertn. De fruct. 2 (1791) 402. **Ic.**: Gaertner, ibid. t. 167.

Perennial. Root tuberous. Stem up to 75–80 cm high, angular, almost glabrous or with occasional hairs. Leaves narrowly linear, up to 25–30 cm long, 1.0–1.5 cm wide, with prominent midrib and slightly curled and thickened margin, with punctate, sessile glands. Capitula in spikes up to 30–35 cm long, in axil of narrow bracteal leaf; involucre oblong, three- or four-rowed; bracts greenish purple; outer bracts ovate, middle ones oblong-ovate, inner bracts much narrower and pale. Florets eight in capitulum; corolla and cylindrical styles projected far beyond it, purple. Achenes cylindrical, cuneate at base, ribbed, ciliate along ribs; pappus longer than corolla; bristles hairy. Flowering VII–VIII.

24 Introduced. —*Caucasus*: Western Transcaucasia (vicinity of Batumi). *General distribution*: North America, from where it was described. Type in London.

Tribe 2. **ASTEREAE** Cass. in Bull. Soc. Philom. Paris (1815) and in Dict. Sc. Nat. III, Suppl. (1816) 64, XX (1821) 375, XXXVII (1825) 458, LX (1830) 581; O. Hoffm. in Pflanzenfam. IV, 5 (1889–1894) 142. —Trib. Asteroideae Less. in Linnaea V (1830) 142, p. p.; DC. Prodr. V (1836) 211 p. p.; Benth. in Benth. and Hook. f. Gen. Pl. II (1873) 165, 174. —Trib. Astérées Baill. Hist. des Plantes VIII (1882) 71 p. p. —Capitula usually heterogamous, peripheral florets pistillate, ligulate, or all florets in capitulum tubular; less often capitula homogamous as a

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[1] Treatment by S.G. Tamamschjan.

[2] The name is of unknown origin.

result of reduction of peripheral florets. Receptacle glabrous or alveolate, or with scaly bristles, less often with shedding scales. Anther at base mostly obtuse and almost undivided. Style branches flat, almost always with densely pilose appendage. Corolla of disk florets usually yellow; corolla of ray florets either yellow (capitulum homochromous) or of other color (capitulum heterochromous). Leaves almost always alternate.

Herbs, semishrubs, or shrubs distributed throughout the world and particularly abundant in the temperate latitudes of America.

Note. The Astereae, like most other natural groups in the Compositae, was first described by the French scientist H. Cassini in a number of works summarized by him in 1830 (*Dict. Sc. Nat.*, Vol. LX) and in 1834 (*Opuscules phytologiques*, Vol. III). Modern specialists on the composites are still astonished by the naturalness of the groups identified by Cassini, although he, naturally, did not think of phylogeny in the modern sense of this concept. After Cassini, Lessing (Chr. Lessing, *Linnaea* V, 1830) also included the Heliantheae and Inuleae, which had disrupted the naturalness of the Astereae, in the tribe Asteroideae, established by him. De Candolle (*Prodromus*...V, 1836) accepted Lessing's system. G. Bentham (G. Bentham in Bentham and Hooker, *Genera plantarum* II, 1873), the best expert on the composites after Cassini, independent of the latter, came to conclusions concerning the system of the Astereae that were similar to those of Cassini. Bentham put forward many valuable ideas about generic relations within the Astereae and the links of this tribe with the others (cf. particularly his work "Notes on the Classification, History and Geographical Distribution of Compositae," *Journ. Linn. Soc., Bot.*, Vol. XIII, 1873). The system of Hoffmann (O. Hoffmann, Compositae, in *Nat. Pflanzenfamilien*, Teil IV, Abt. 5, 1889–1894), with respect to the Astereae, broadly follows the system of Bentham. In regard to the status of the Astereae in the Compositae as a whole, of late the opinion that they are directly related to the Heliantheae is beginning to dominate; this viewpoint is well founded in the already mentioned work of Cronquist (A. Cronquist, 1955; cf. page 14).

The vagueness of generic boundaries, generally characteristic of a majority of the tribes of the Compositae, is particularly characteristic of the Astereae.

25 KEY TO GENERA OF ASTEREAE[1]

1. Dioecious shrubs up to 1–3 m high................1479. **Baccharis** L.

+ Monoecious herbs or semishrubs, almost always considerably low statured..2

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[1] Compiled by S.G. Tamamschjan and M.E. Kirpicznikov.

2. Capitula usually with four or five florets, less often three to six (exclusively tubular). Semishrubs or small shrubs, within the USSR found exclusively in Soviet Central Asia..1473. **Pseudolinosyris** Novopokr.

+ Capitula with comparatively larger number of florets; in any case more than six, occasionally five (some species of *Linosyris*), but then plants herbaceous, perennial..3

3. Tubular florets (disk florets) in center of capitulum sterile (not developing achenes), peripheral florets fertile..............................4

+ Tubular florets in center of capitulum fertile, peripheral ones sterile or fertile..5

4. Pappus two-rowed, its hairs numerous..1477. **Erigeron** L. (cf. also step 37).

+ Pappus one-rowed, of few (2–10), often more or less serrate, deciduous hairs. Involucral bracts with glutinous glandular hairs. An introduced plant; within the USSR found only in the southern UkrSSR...1454. **Grindelia** Willd.

5. Plants scapose, with solitary capitula..6

+ Plants not scapose, solitary or most often numerous capitula on more or less leafy stalks (sometimes leaves highly reduced — very small and narrow)...7

6. Leaves rosulate, spatulate, or obovate. Achenes small, short-hairy to glabrous or almost glabrous. Pappus most often absent or of short thick hairs..1458. **Bellis** L.

+ Leaves narrow, almost setaceous (grasslike). Achenes with dense silvery pubescence. Pappus many-rowed, consisting of thin rough hairs..1469. **Arctogeron** DC.

7. Outer involucral bracts leafy, considerably larger than one or two rows of much smaller inner bracts....................***Callistephus** Cass.

+ Outer involucral bracts not leafy and not very distinct from inner bracts..8

8. All achenes or only peripheral ones, devoid of pappus.............9

26 + All achenes with well-developed pappus: only sometimes pappus consisting of sparse short bristles...13

9. All florets in capitulum tubular. Inner achenes with one or two short bristles, peripheral ones without pappus. Within USSR plants found only in Transcaucasia (including Talysh)...1456. **Dichrocephala** L'Herit.

+ Peripheral florets ligulate...10

10. Pappus absent only on peripheral achenes, central ones with 10–15 well-developed bristles...1477. **Erigeron** L. (section *Phalacroloma*).

+ Pappus absent on all achenes, or scarcely distinct....................11

11. Perennial plants, with comparatively large (about 2 cm wide and more) capitula....................12

+ Annual or biennial plants, with small (not more than 1 cm wide) capitula....................1457. **Myriactis** Less.

12. Capitula about 2 cm wide, solitary at tips of branches. Within USSR plants found in Dauria and the Far East....................1459. **Boltonia** L'Herit.

+ Capitula 3–4 cm wide, often clustered in panicles. An introduced plant, so far found only in Adzharia (weed in tea plantations)....................1460. **Gymnaster** Kitamura

13. Capitula with yellow ligulate flowers....................14

+ Capitula without ligulate flowers, or with ligulate flowers of different colors (but not yellow!)....................15

14. Capitula oblong, infundibuliform, or almost cylindrical....................1455. **Solidago** L.

+ Capitula of different shape.......1477. **Erigeron** (cf. also step 37).

15. Entire plant profusely and densely pubescent, pubescence finely tomentose and also covered with capitate stalked glands (woolly pubescence lacking to a considerable extent in fully mature specimens). Peripheral florets ligulate, with blue or dark blue ligules that spirally curl outward after flowering is over. Annuals with strong pleasant fragrance; within the USSR found only in Soviet Central Asia....................1478. **Lachnophyllum** Bge.

+ Plants variously pubescent. Ligulate florets usually not blue or dark blue. Plants usually biennials or perennials, less often annuals, but then devoid of strong and pleasant fragrance....................16

27 16. Pappus (in fully mature achenes!) smoke-gray, brown or rust-red; in peripheral florets pappus often coronate, considerably shorter than in disk florets. Involucre mostly two-rowed, more or less uniform. Almost exclusively biennial plants....................1461. **Heteropappus** Less.

+ Pappus of various colors (most often white or dirty white, but also of various other colors) or alike in all achenes (coronate pappus always absent), involucre mostly many-rowed and imbricate. Predominantly perennials, less often biennials or annuals....................17

17. Semishrubs....................18

+ Herbs, most often perennials or biennials....................20

18. Leaves with recurved margins and with short cartilaginous acute cusp. Caudex distinct....................1467. **Asterothamnus** Novopokr.

+ Leaves flat, usually without cartilaginous acute cusp. Caudex not so distinct....................19

19. Pappus of similar scabrous bristles, in two or three irregular rows..................1471. **Galatella** Cass. (*G. saxatilis* Novopokr.)

+ Pappus double, of dissimilar bristles; outer row or flat bristles, inner ones of equal or slightly unequal, long, thin, and somewhat serrate hairs.. ....1463. **Kemulariella** Tamamsch. (cf. also step 36).

20. All leaves with one prominent vein...21

+ At least some leaves with three or more prominent veins........23

21. Ligulate florets always absent......................1472. **Linosyris** Cass.

+ Ligulate florets present...22

22. Ligulate florets white. Biennials; within USSR found only in Dauria and Ussuri.................................1470. **Turczaninowia** DC.

+ Ligulate florets bright bluish or pinkish-violet. Perennials, growing in Soviet Central Asia..........................1471. **Galatella** Cass. (*G. tianschanica* Novopokr. and *G. polygaloides* Novopokr.).

23. Disk florets somewhat zygomorphic; part of corolla facing toward center of capitulum, somewhat more deeply notched and therefore with much longer teeth than part facing outward......24

+ Disk florets actinomorphic...25

24. Pappus slightly longer than achene; pappus hairs in upper part appreciably thickened..........................1468. **Krylovia** Schischk.

28 + Pappus usually three to four times as long as achene; pappus hairs somewhat narrowed in upper part.................................. ....1462. **Aster** L. (cf. also step 38).

25. Peripheral florets sterile (not developing achene)............... ....1471. **Galatella** Cass. (cf. also step 38).

+ Peripheral florets fertile..26

26. Pappus of sparse and very short (0.25–1.0 mm long) bristles or not exceeding one-third length of achene. Plants within USSR found only in Dauria and the Far East.......................................27

+ Pappus well developed and not so short....................................28

27. Pappus of short, unequal, usually rust-colored hairs connate at base (sometimes pappus scarcely developed — cf. also step 12). Capitula fewer, terminal, solitary. Involucral bracts imbricate, dry, hard..1459. **Boltonia** L' Herit.

+ Pappus of sparse, unequal, very short bristles not exceeding 1 mm. Capitula comparatively numerous in loose or spreading corymb. Involucral bracts two- or three-rowed, herbaceous...1466. **Kalimeris** Cass.

28. Pappus one-rowed, of similar bristles connate at base into ring and collectively detaching from achene on maturity. Annuals; within USSR growing only in Soviet Central Asia, mostly in damp and saline places.................1464. **Chamaegeron** Schrenk.

+ Pappus bristles or hairs many-rowed or if one-rowed, then persisting with achene after maturity. Mostly perennials or biennials, less often annuals..29

29. Involucral bracts succulent..30

+ Involucral bracts herbaceous or somewhat hard to coriaceous, but not succulent..32

30. Plants totally devoid of pubescence (glabrous). Pappus after flowering three to four times as long as achene..1474. **Tripolium** Nees

+ Plants pubescent at least in upper part or if glabrous or subglabrous, then pappus relatively shorter..31

31. Stem and branches in upper part with longitudinal stripes of stiff hairs. Pappus two-rowed, of uniform bristles. Achenes without distinct edges.................1476. **Brachyactis** Ldb. (cf. also step 35).

+ Plants variously pubescent or (less often!) almost glabrous. Pappus one-rowed. Achenes narrow, cylindrical, four-angled..............................1475. **Conyzanthus** Tamamsch. (cf. also step 33)

29 32. Achenes glabrous or almost glabrous, cylindrical. Basal leaves long-petiolate, cordate. Within USSR plants found only in the Far East.:..1465. **Doellingeria** Nees

+ Achenes pubescent, mostly of other shape, or basal leaves of other type..33

33. Tubular disk florets less numerous (four to seven). Pappus one-rowed. Weed, within USSR found only in Transcaucasia...1475. **Conyzanthus** Tamamsch.

+ Tubular disk florets more numerous, or pappus in two or more rows..34

34. Peripheral pistillate florets shorter than pappus or more or less as long..35

+ Peripheral pistillate florets longer than pappus............................36

35. Pappus two or more times as long as achene...1476. **Brachyactis** Ldb. (cf. also step 31).

+ Pappus approximately of same length as achenes. Endemic. Soviet Central Asian plant (the Tien-Shan and western part of Pamiro-Alai Region)...1468. **Krylovia** Schischk.

36. Outer row of pappus of short flat bristles, inner one of equal or slightly unequal, long, and thin hairs. Achene oblong, sometimes slightly compressed dorsally with three fine ribs. Receptacle conical or hemispherical, alveolate, somewhat membranous along edges of alveolae. Perennials or semishrubs endemic to the Caucasus...................................1463. **Kemullariella** Tamamsch.

+ Pappus of similar hairs or bristles, or achenes of other shape..37

37. Pappus two-rowed; hairs (or bristles) of outer row usually much shorter than those of inner row........................1470. **Erigeron** L.

+ Pappus two- or one-rowed, consisting of hairs or bristles of equal length..38

38. Peripheral ligulate [ray] florets numerous, in one, one-and-one-half, or less often two rows. Involucre infundibuliform or hemispherical. Achenes usually densely pubescent with erect, upward-directed, compressed hairs, less often sparsely pubescent or almost glabrous. Pappus comparatively longer, usually three to four times as long as achene, consisting of several setaceous hairs in one or two rows. Mostly perennials or biennials, without many prominent veins on leaves....................................1462. **Aster** L.

+ Peripheral ligulate florets totally absent or comparatively less numerous (1–20), in one whorl. Involucre broadly- or narrowly obconical or obovate, cylindrical, and hemispherical. Achenes 30 uniformly pubescent with long semi-appressed white hairs. Pappus comparatively shorter, usually not more than two times as long as achene, and with two (three) irregular rows of similar setaceous hairs. Perennial herbs, with lower and middle or only lower leaves with three veins but other leaves with one vein, and then ligulate florets invariably present.........1471. **Galatella** Cass.

Subtribe 1. **SOLIDAGININAE** O. Hoffm. in Pflanzenfam. IV, 5 (1889–1894) 145. —Peripheral florets pistillate, ligulate, and, like disk florets, yellow (in rare cases color different or peripheral ligulate florets reduced).

GENUS 1454. **Grindelia** Willd. [1,2]

Willd. in Ges. Naturf. Fr. Berl. Mg. I (1807) 259. —*Aurelia* Cass. in Bull. Soc. Philom. (1815) 175; Dict. Sc. Nat. XXXVII (1825) 468

Capitula heterogamous, mostly with pistillate ligulate florets numbering 15–45, or only with tubular, usually sterile florets. Involucre somewhat coriaceous, bracts with herbaceous tips recurved, almost similar, sometimes imbricate. Receptacle glabrous, flat or convex. Corolla of both peripheral and disk florets usually yellow. Anthers entire at base, obtuse; style branches flat with pilose linearly-lanceolate or much shorter appendages. Achenes compressed, indistinctly four-angled and veined. Pappus of 2–10, often more or less serrate, deciduous bristles, Annual,

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[1] Treatment by S.G. Tamamschjan.

[2] In honor of the pharmacist and botanist David Grindel (1776–1836), professor in Derpt.

biennial, or perennial herbs, often with woody base and alternate leaves, with more or less punctate glandular surface, and with many or solitary hemispherical capitula.

Of the 50 North and South American species, we have one.

1. **G. squarrosa** (Pursh) Dunal in Mém. d. Mus. d'hist. natur. 5 (1819) 50. —*Donia squarrosa* Pursh, Fl. Am. Septen. II (1814) 559.

Annual. Glabrous, 25–70 cm high; root thin, fusiform; stem solitary, simple or sometimes branched at base, somewhat angular, cylindrical; leaves lanceolate or oblong-spatulate; lower leaves early-deciduous, middle leaves 5–10 cm long, upper ones distinctly reduced, entirely acutely serrate with distinct midrib on dorsal side, bright green. Capitulum 2–3 cm wide; involucral bracts glandular-hairy, sticky, more or less imbricate; ligulate florets yellow, two times as long as involucre. Achenes dark brown, somewhat compressed, small, up to 2 mm long. Flowering VII–IX.

31 Introduced. Rare along roadsides and ditches. —*European Part*: Black Sea Region (Nikolaev Province). *General distribution*: North and Central America. Described from North America. Type in London?

GENUS 1455. **Solidago** L. [1,2]

L. Sp. pl. (1753) 878

Flowers mostly in numerous small or medium heterogamous capitula, clustered in apical, paniculate or corymbose inflorescence; central flowers (disk florets) yellow, bisexual, tubular-infundibuliform; peripheral flowers also yellow, pistillate, ligulate, less numerous (5–15), in one whorl, often widely spaced or totally absent. Involucre oblong or narrow-campanulate, many-rowed, bracts numerous, imbricate; common receptacle glabrous or finely ciliate, punctate. Anthers obtuse at base, basifixed. Style furcate into two flat branches, enlarged at tip and somewhat pubescent there, without any thickening at point of bifurcation and forming two prominent marginal fringes; pappus one- or two-rowed, its hairs simple, thin, more or less equal, scabrous. Achenes subterete, many (8–12)-ribbed, narrowed toward both ends. Perennial herbs (in our country), with simple stems in lower part (up to inflorescence) and with entire, alternate leaves, less often semishrubs.

About 120 species, mostly American, belong to this genus.

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[1] Treatment by S.V. Juzepczuk.

[2] From the Latin word *solidare* (*solidum agere*)—to strengthen; in the given context, to cure (the plant is considered to be medicinal).

1. Capitula usually comparatively large, up to 10–20 mm wide and 7–8 mm long, less often smaller; inflorescence branches in racemes or panicles all around, never secund (sometimes almost capitate)..2
+ Capitula small, not more than 3 mm wide and 5–6 mm long; inflorescence secund, usually arcuate......................................16
2. Common inflorescence capitate or corymbose...........................3
+ Common inflorescence racemose or paniculate, usually somewhat elongated...4
3. Common inflorescence spherically capitate; cauline capitula on short peduncles...16. **S. compacta** Turcz.
+ Common inflorescence corymbose; capitula sessile.................... ....*S. **graminifolia** (L.) Ell.
4. Achenes entirely pillose (hairs in lower part very scattered)..5
+ Achenes only in upper part pilose or entirely glabrous..............15
32 5. Involucre four- to six-rowed...6
+ Involucre two- or three-rowed..9
6. Capitula 6–8 mm long. Leaves narrowly lanceolate, glabrous. Western Transcaucasian plant (region of Poti, swamps)............. ....2. **S. turfosa** Woron. ex Grossh.
+ Capitula much longer (up to 15 mm long)...................................7
7. Thickset but robust, densely leafy plants; all leaves, including upper ones, coarse-toothed; inflorescence compact, often highly condensed (almost capitate). Plants of Crimean mountain pastures...4. **S. jailarum** Juz.
+ Plants with other characters..8
8. Cauline leaves numerous (usually 20–30), not large for plant height (particularly in upper part usually quite similar in size, compactly arranged and entire); inflorescence often highly branched, branches long, with undeveloped lower branches (Crimean forest plant)..3. **S. taurica** Juz.
+ Plants with other habit...................................1. **S. virgaurea** L.
9. Involucre most often turbinate, pubescent; leaves acute........ ....7. **S. armena** Kem.-Nat.
+ Involucre campanulate, glabrous or somewhat pubescent; leaves obtuse...10
10. Capitula usually solitary, axillary, on well developed, up to 2.5 cm long, peduncles...................................8. **S. lapponica** Wither.
+ Peduncles slightly shortened; inflorescence usually compact spicate raceme...11
11 Stems 6–25 cm high; foliage not profuse; leaves small, glabrous or somewhat pubescent; involucral bracts usually glabrous;

achenes often with scattered or even solitary hairs in lower half..5. **S. alpestris** Waldst. and Kit.

+ Stems 30–70 cm high; foliage profuse; leaves more or less pubescent; involucral bracts usually somewhat pubescent; achenes normally pubescent..........................6. **S. caucasica** Kem.-Nat.

12. Achenes hairy only in upper one-third to half, glabrous in remaining part..13

+ Achenes entirely glabrous or some with occasional hairs at tip...15

13. Involucre usually four-rowed; inflorescence often strongly branched..9. **S. dahurica** Kitag.

+ Involucre two- or three-rowed; inflorescence sparsely branched. 14

14. Cauline leaves lanceolate, with indistinct teeth or leaf margins entire...10. **S. gebleri** Juz.

+ Cauline leaves broadly elliptical or broadly ovate, all coarsely and obtusely toothed.............13. **S. kuhistanica** M. Pop. ex Juz.

33 15. Branches of common inflorescence and peduncles greatly shortened; heads arranged compactly..16

+ Branches of inflorescence (peduncles) elongated; heads arranged loosely...17

16. Inflorescence cylindrical; heads 7–12 mm long; involucral bracts obtuse...12. **S. pacifica** Juz.

+ Inflorescence turbinate; heads about 5 mm long, involucral bracts acute..13. **S. curilensis** Juz.

17. Basal and lower cauline leaves gradually narrowed toward base..14. **S. spiraeifolia** Fisch.

+ Basal and lower cauline leaves roundish at base, truncate, or abruptly narrowed..15. **S. cuprea** Juz.

18. Leaves with three parallel veins, midrib, and two lateral veins 19

+ Leaves with pinnate venation, or only distinct midrib (without lateral veins)..20

19. Stem more or less pubescent or scabrous; leaves lanceolate, serrate. Involucral bracts acute, sometimes subobtuse............. ....17. **S. canadensis** L.

+ Stem glabrous; leaves linearly lanceolate, entire, Involucral bracts subobtuse...*S. **rupestris** Raf.

20. All leaves entire, narrowly lanceolate, acuminate, only with distinct midrib, glabrous..*S. **odora** Ait.

+ At least lower leaves toothed...21

21. Leaves thin, lower ones broadly ovate, short-acuminate........... ....*S. **arguta** Ait.

+ Leaves coarse..22

22. Leaves short-petiolate, finely and sharply serrate-toothed..........23

+ Leaves sessile, sparsely serrate-toothed..............***S. serotina** Ait.

23. Leaves ovate-lanceolate or oblong-lanceolate. Inflorescence short, with a few adpressed branches...........***S. neglecta** Torr. and Gr.

+ Leaves lanceolate. Inflorescence long, loose, with large number of branches...***S. juncea** Ait.

Subgenus I. **Virgaurea** DC. Prodr. V (1836) 330 (pro sect.); A. Gray in Proc. Amer. Acad. XVII (1892) 189.—Ligulate florets usually smaller than disk florets (former sometimes absent). Capitula on more or less developed peduncles, in spicate, racemose, or paniculate inflorescence. Involucral bracts flat.

Of the sections belonging to this subgenus, we have two; the first of them encompasses the wild species, the second, exclusively the introduced or naturalized species.

34 *Section* 1. THYRSIFLORAE A. Gray in Proceed. Amer. Acad. XVII (1882) 190.—Capitula medium or comparatively large, usually 7–8 mm long; in somewhat narrow and long, erect, all-around panicle or spicate, less often almost capitate inflorescence.

Note. L.M. Kemulariya-Natadze distinguishes two series for the Caucasus within the section on the basis of the number of series of involucral bracts: *Multiseriatae* Kem.-Nat. in *Tr. Tbil. Bot. Inst.*, VI (1938) 96 and *Pauciseriatae* Kem.-Nat. l. c. 100. We do not consider such a division into two groups, practically rather convenient for segregating the species treated here (lowland and high-mountain species), natural, because the second of the named "series" is clearly polyphyletic, and we place all wild Caucasian goldenrods in the same series.

Series 1. Pauciradiatae Juz.—Cauline leaves (except uppermost) with distinct petiole. Inflorescence most often elongated (usually not spherically capitate).

1. **S. virgaurea** L. Sp. pl. (1753) 880; Ldb. Fl. Ross. II, 2, 493 p. max. pte.—*S. virga aurea*, Schmalh. Fl. II, 38.—*S. vulgaris* Mill. Gard. Dict. ed. VIII (1768) No. 2; Lam. Fl. Fr. II, 145.—*S. flexuosa* Gilib. Fl. lithuan. III (1782) 203; Exerc. phytol. I (1792) 167.—*Chrysoraphis vulgaris* Rupr. Fl. ingr. (1860) 562.—*S. virgaurea* var. *vulgaris* DC. Prodr. V (1836) 338.—*S. virgaurea* L. *vulgaris* Ldb. l. c. saltem p. max. parte; Syreistsch. Ill. Fl. Mosk. Gub. III, 238.—*S. v.* var. *vulgaris* ff. *genuina* and *foliosa* Fiori Fl. an. d'Ital. II (1926) 614.—*S. v.* var. *angustifolia* C. Koch Syn. (1837) 390.—*S. v.* var. *maxima* C.

Koch in Linnaea XVIII (1850) 150; Ldb. l. c. —*S. v.* var. *obtusissima* Kem.-Nat. ex Grossh. Fl. Kavk. IV (1934) 91. —*S. v.* var. *condensata* Kem.-Nat. in Tr. Tbil. Bot. Inst. VI (1938) 98. —**Ic.**: Rchb. Ic. Fl. Germ. XVI (1853) t. 911; Sturm, Fl. Deutschl. ed. 2, XIII (1905) t. 11; Hegi, Ill. Fl. VI, 1, 410, t. 258; Syreistsch. Ill. Fl. Mosk. Gub. III, 238. —**Exs.**: Hohenack. Arzn. u. Handelspfl. No. 386; Billot, Fl. Gall. et Germ. No. 36; Kern. Fl. Austro-Hung. No. 3768; Fl. Ital No. 172, 173; Callier, Fl. Siles. No. 832; Hayek, Fl. Sti. No. 1072; Fl. exs. reip. Bohem. sloven. No. 917; Woloszcz. Fl. Polon. exs. No. 186; Bge. Herb. Balt. No. 372; Pabo and Cholovsk. Mogil. XIX, 2; Meinsh. Pl. Diaphor. No. 198; Herb. Fl. Ingr. No. 305 (Type form), 305b (*β. angustifolia*); GRF No. 570, 3947. —European goldenrod.

Perennial. Rhizome horizontal or obliquely ascending; stem most often (3)15–100 cm (sometimes more than 1 m — f. *maxima* C. Koch) high; erect, straight or somewhat flexuous, usually simple up to inflorescence, in lower part glabrous, in upper part glabrous or somewhat pubescent, less often entire stem more or less densely puberulent; more or less profusely but usually sparsely leafy. All leaves glabrous or somewhat puberulent, particularly along margins and veins; basal leaves ovate, oblong-ovate, spatulate or elliptical, abruptly narrowed into winged 35 petiole, petiole as long as or slightly longer than lamina; coarsely serrate; cauline leaves gradually decreasing in size upward, on gradually shorter-winged petioles, subapically sessile, oblong, elliptic, or lanceolate, narrowed toward both ends, usually acute; often all cauline leaves linearly lanceolate (f. *angustifolia* C. Koch — for example, particularly in dry meadows and sandy places), serrate or almost entire. Inflorescence apical, often compound, somewhat elongated, compact or loose, narrowly cylindrical-racemose with comparatively short and few-flowered branches in axils of rather large subtending leaves (f. *foliosa* Fiori-particularly in shady places), or spreading turbinate panicle, with long, many-flowered branches in axils of comparatively small subtending leaves (f. *genuina* Fiori) in more open places, less often short and capitate (f. *condensata* Kem.-Nat.). Capitula numerous, medium (7)10–15(18) mm long, 10–15 mm wide, with short, often erect or almost erect, mostly short peduncles, usually with numerous bracts; involucre infundibuliform, 4–8 mm long; bracts many-rowed (four to six rows), oblong, linear, or linearly lanceolate; quite dissimilar in size, from outer ovate-lanceolate (2–3 mm long) to inner lanceolate, gradually increasing in length (up to 6–7 mm long), acute, less often subobtuse or obtuse (f. *obtusisquamea* Kem.-Nat.), midrib green, margins membranous, glabrous. Florets yellow, peripheral florets with ligule about 8 mm long and about 2 mm wide, oblong, oblong-linear or linear, flat, as long as involucre. Achenes 3–4 mm, entirely pubescent, pappus hairs 4–5 mm long. Flowering VIII–X; fruiting up to XI. (Plate I, Fig. 3).

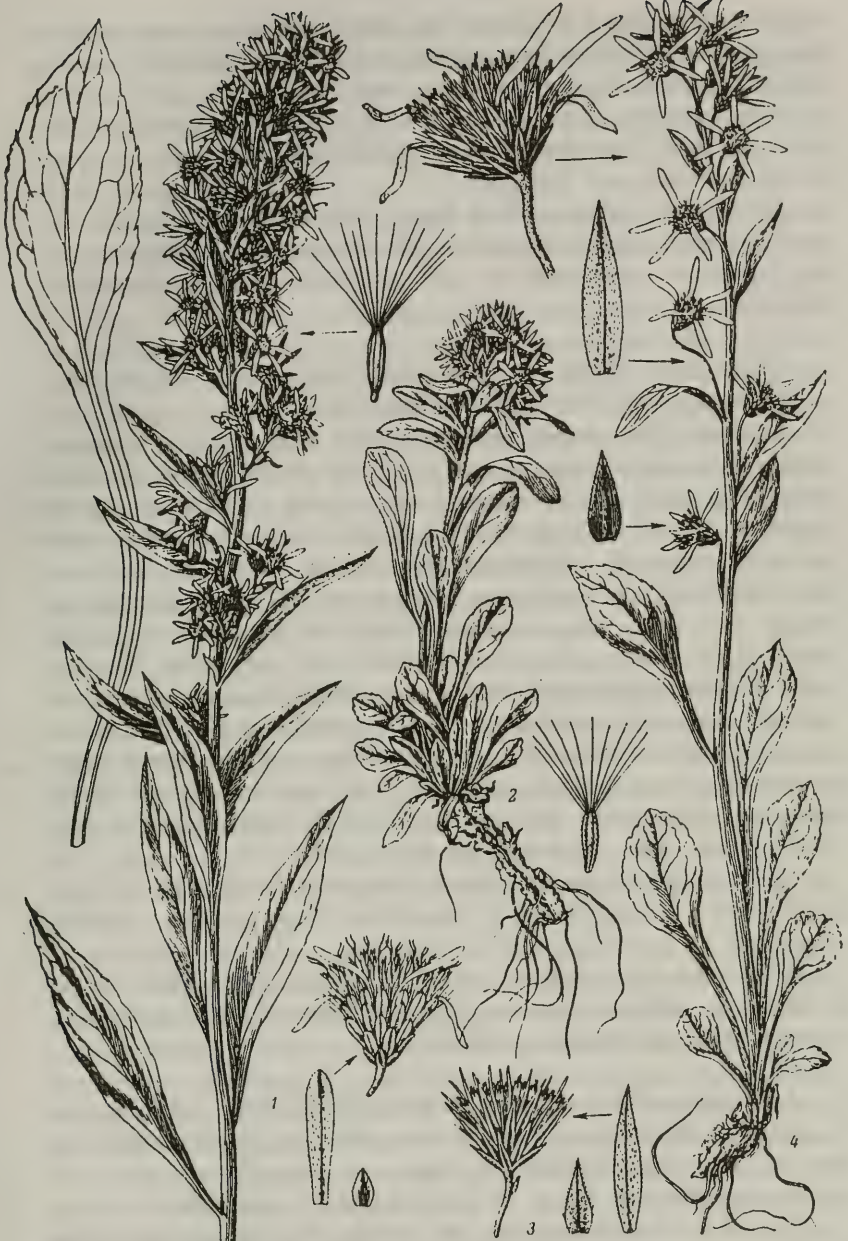
Meadows, forest and steppe clearings, dark coniferous, pine, mixed, and birch forests (generally not dense) and their edges, scrubs. — *European Part*: Karelia-Lapland, Ladoga-Ilmen, Dvina-Pechora, Volga-Kama, Baltic Republics, Upper Dnieper, Upper Dniester, Middle Dnieper, Volga-Don, Black Sea Region, Lower Don, Trans-Volga; *Caucasus*: Ciscaucasia, Dagestan, eastern and western Transcaucasia; *Western Siberia*: Ob Region, Upper Tobol, Irkutsk, Altai. *General distribution*: Almost the whole of Western Europe. Described from Western Europe. Type in London.

Note. A quite polymorphic species, it is highly variable particularly in the size and shape of the leaves, degree of complexity of the inflorescence, and number and size of the capitula. The work of the Swedish scientist Turesson is well known, who delimited a number of "ecotypes" within this species lacking any geographical pattern and having only to a small extent an heriditary basis (which maintain their distinctive features for a long time, however, after transplanted individuals are cultivated under the same environmental conditions). Somewhat greater importance is attached to several geographically localized forms, of which 36 it is worth mentioning here the Kolkhidian and Crimean races (*S. turfosa* Woron. and *S. taurica* Juz.—cf. below). Considerably more distinct, although linked with the basic type of intermediate forms, are the alpine and arctic races.

Economic Importance. Although an ancient medicinal plant (radix et herba, virgae aureae), in recent times its importance in this regard has been lost. Compare the latest botanical-chemical-pharmaceutical monograph of the European goldenrod: R. Gnekow. Die Goldrute, *Solidago virga aurea* L. Hamburg, 1938. Nectariferous plant; used as a dye (colors cloth yellow and brown); laticiferous plant. The same importance, apparently, is attributed to all closely related races belonging to the series *Pauciradiatae*, but their economic importance has not been specially studied so far.

2. **S. turfosa** Woron. ex Grossh. Fl. Kavk. IV (1934) 91; Kem.-Nat. in Tr. Tbil. Bot. Inst. VI, 99; Grossh. Opredel. Rast. Kavk. 439.— **Ic.**: Kem.-Nat. op. cit. 110 (Fig. 3).

Perennial. Stems tall, thin, glabrous, reddish. Leaves narrow, lanceolate, 1.0–1.5, less often up to 2 cm wide; lower leaves with long petioles as long as or slightly longer than lamina; middle leaves narrowed into short, winged petioles; upper leaves sessile, entire. Inflorescence loose panicle, with lateral branches bearing numerous, small, 6–10 mm long capitula; peduncles rather long, slender, usually with several greatly reduced bracteal leaves. Involucre small, 4–6 mm long, turbinate, many-rowed, glabrous; involucral bracts very unequal, gradually



37 Plate I.
1—*Solidago pacifica* Juz., habit, basal leaf, achene, capitulum, two involucral bracts; 2—*S. compacta* Turcz., habit; 3—*S. virga-aurea* [sic; *virgaurea*] L., capitulum, two involucral bracts, achene (at top); 4—*S. lapponica* Wither., habit, capitulum, two involucral bracts.

reducing; outer ones 1.5–2.2 mm long, ovate, subobtuse; inner ones oblong, considerably longer than outer. Ligules of peripheral florets shorter than involucre. Achenes small, up to 2 mm long.

Peaty marshes. —*Caucasus*: Western Caucasia (Rionskaya lowland). Endemic. Described from Kobuleti (near Sultanka). Type and isotype in Tbilisi and Leningrad.

Note. A race differing little from *S. virgaurea* L. (mainly by the extremely small size of the capitula), the importance of which is probably somewhat exaggerated by A.A. Grossheim and L.M. Kemularia-Nathadze.

3. **S. taurica** Juz. n. sp. in Addenda XXIV, 575. — *S. virgaurea* α. *vulgaris* Ldb. Fl. Ross. II (1844–1846) 493 p. p.

Perennial. Tall, densely leafy plant with quite hard, cylindrical or angular stems and numerous (usually 20–30) compactly arranged (particularly in upper part of stem) leaves, usually without anthocyanin coloration. Leaves not large for plant height, ovate or lanceolate, acute 39 and with acute teeth, coriaceous; upper cauline leaves very similar in size, usually narrow, very acute, often entire; all leaves glabrous and usually only along margins coarsely hairy. Inflorescence with many florets, mostly loose, often much branched, with long lateral branches, lower branches usually undeveloped; subtending leaves of inflorescence not well developed, considerably shorter than branches of inflorescence; capitula comparatively small; involucre 5–7 mm long, four-rowed, bracts linearly lanceolate, acute or subobtuse, with green midrib and whitish margins. Ligules about 3–5 mm long, narrow. Achenes not densely short hairy to apex. Flowering end of VII, VIII.

Forests (mostly pine, but mixed ones also), forest edges. —*European Part*: Crimea. Endemic. Described from Ai-Petri. Type in Leningrad.

Note. Like the preceding species, only a weakly marked race of *S. virgaurea*, retaining, however, its characteristic features during cultivation under experimental conditions.

4. **S. jailarum** Juz. n. sp. in Addenda XXIV, 575. — *S. virgaurea* γ. *alpestris* Ldb. Fl. Ross. II (1844–1846) 494 p. p. quoad pl. tauricum, non DC. —*S. virgaurea* (resp. *S. virga aurea*) auct. fl. taur. p. p. —*S. virga aurea* Schmalh. Fl. II, 38 p. p., quoad, pl. taur., non L.

Perennial. Usually thick-set, but robust, often red-stemmed plant, 15–30 cm high, often densely leafy, but with comparatively fewer densely arranged cauline leaves (usually 10–15) with predominance of short and broad, coarsely and large-toothed leaves; teeth quite distinct even in upper cauline leaves. Inflorescence many-headed, compact, closely compressed, branches usually greatly shortened, in extreme cases almost capitate; subtending leaves of inflorescence usually well developed; involucre four-rowed, bracts pale green, with wide, white scarious margin, obtuse. Ligules large, up to 6 × 1.5 mm. Achene about 5 mm long, hairy up to tip, though not densely (in lower part often with occasional hairs). Flowering VII–VIII.

Forest edges, meadows, and slopes on the mountain pastures [*Yaila*]. —*European Part*: Crimea. Endemic. Described from Babugan-yaila. Type in Leningrad.

Note. This species is connected through intermediate forms with the common forest form of montane Crimea (*S. taurica* Juz.), but its typical form is extremely characteristic and not similar to other, analogous alpine forms, particularly *S. alpestris* W.K., for which it was taken by Ledebour. In the structure of the involucres, it is not especially close to it and resembles more *S. virgaurea*, being one of the examples of the "modifying effect of the Crimean mountain pastures," which we mention in one of our works [S.V. Juzepczuk, "Zametki o nekotorykh novykh kriticheskikh i redkikh rasteniyakh krymskoi flory (Notes on some new endangered and rare plants of the Crimean flora). *J. Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR*, Vol. XIV (1951) 4].

5. **S. alpestris** Waldst. and Kit. apud. Willd. Sp. pl. ed. 4, III, 3 (1804) 2065. —*S. pumila* Pers. Syn. II (1807) 450. —*S. virga aurea* var. 40 *alpestris* DC. Prodr. V (1836) 338. —*S. virgaurea* var. *alpestris* Beck, Fl. N. Öst. (1893) 1164. —*S. virgaurea* subsp. *alpestris* var. *pumila* Gaud. in Waldst. and Kit. Ic. Pl. rar. Hung. III (1812) 208. —**Ic.**: Rchb. Ic. Fl. Germ. XVI (1853) tab. 911 and tab. 913. —**Exs.**: Sieber. Herb. austr. No. 260, Rchb. Fl. Germ. No. 2423; Kern. Fl. Austro-Hung. No. 3767.

Perennial. Stem not tall, (6)12–25 cm high, erect or sometimes slightly ascending, straight or flexuous, simple or with very short branches, glabrous or in uppermost part somewhat pubescent, pale or reddish (particularly in lower part), with few usually small leaves. Basal leaves ovate or oblong, obtuse, narrowed into relatively short, narrow-winged petiole, coarsely acute or less often obtusely serrate, mostly glabrous; cauline leaves oblong, lower ones obtuse or subobtuse, upper ones acute or subacute, on gradually shortened much broad-winged petioles, with sharper teeth, glabrous or slightly pubescent (generally only along midrib and margins). Inflorescence apical, usually simple, comprising few or less often numerous capitula, loose or more often compact, sometimes forming rather compact spicate racemes; subtending leaves of inflorescence comparatively well developed (particularly in lower capitula); capitula comparatively large, about 1.5–2.0 cm wide;

involucres 0.6–1.0 cm long, bracts bright green with white fringe, two-rowed, in small numbers, acute. Ligules about 6 mm long, and up to 2 mm wide. Achenes up to 5 mm long, weakly hairy, often with only occasional hairs in lower half. Flowering from beginning of VII.

Alpine zone —*European Part*: Upper Dniester. *General distribution*: Northern Europe. Described from Hungary. Type unknown (probably, in Berlin).

6. **S. caucasica** Kem.-Nat. in Tr. Tbil. Bot. Inst. VI (1938) 101; Grossh. Opredel. Rast. Kavk. 439; Kolakovskii, Fl. Abkh. IV, 195. — *S. alpestris* auct. Fl. cauc. non Waldst. and Kit.; Grossh. Fl. Kavk. IV, 91. —*S. virgaurea* var. *alpestris* auct. fl. cauc. non DC. —**Ic.**: Kem.-Nat. op. cit. page 112 (Fig. 5). —**Exs.**: GRF No. 4098.

Perennial. Rhizome nodular, woody; stem slightly ascending at base or erect, 30–70 cm high, reddish with anthocyanin pigment at base or throughout. Leaves obovate-oblong, oblong-lanceolate, or lanceolate, serrate, narrowed into winged petiole shorter than lamina, uppermost leaves often sessile. Inflorescence spicate, more or less compressed, compact or loose, usually discontinuous; peduncles of capitula without or with less numerous bracts, more often densely pubescent; capitula large, 1.0–1.5 cm long, 1.5–2.0 cm wide. Involucre conically infundibuliform, its bracts loosely arranged, not many-rowed; outer bracts lanceo-
41 late, two-thirds as long as narrowly linear inner ones, both somewhat pubescent, acute. Ligules of peripheral florets narrowly oblong, as long as or slightly shorter than involucre. Achenes pubescent. Flowering VII–VIII.

Alpine and subalpine meadows, rhododendron thickets, screes, forest edges at upper limits, logging areas and forest openings in high-mountain forests. —*Caucasus*: Ciscaucasia, eastern and western Caucasia. Described from the Glavny [Main] Caucasian Mountain Range (Donguz-Orun glacier) and the Adzharia-Imeretia Mountains. Type in Tbilisi.

7. **S. armena** Kem.-Nat. ex Grossh. Fl. Kavk. IV (1934) 91; Kem.-Nat. in Trudy Tbil. Bot. Inst. VI (1938) 103; Grossh. Opredel. Rast. Kavk. 439. —*S. armena* var. *laxa* and var. *compacta* Kem.-Nat. op. cit. (1938) 104. —**Ic.**: Kem.-Nat. op. cit. 113, Fig. 6.

Perennial. Stems up to 3.5–6.5 cm high, somewhat thick, erect or slightly ascending at base simple or branched, usually reddish at base, densely pubescent in upper part. Leaves large, broadly lanceolate, acute, coarsely and sharply serrate; lower leaves with petioles longer than lamina, petioles of middle leaves shorter than lamina; upper leaves sessile. Inflorescence loose paniculate, less often compact capitate, lateral branches usually bearing numerous capitula; capitula usually large, 1.5–2.0 cm long, 1.2–2.5 cm wide, with long or less often short peduncles, with one to three reduced apical leaves. Involucre infundibuliform or turbinate, 6–10 mm long, pubescent; bracts two- or three-rowed, spatulate, acute; outer bracts 4–7 mm long, two-thirds as long as inner ones, latter 7–10 mm long, less often both almost equal. Ligules of peripheral florets oblong, 6–8 mm long; as long as or shorter than involucre. Achenes 3–7 mm long, pubescent.

Alpine and subalpine mountain zone. —*Caucasus*: Southern Transcaucasia. Endemic. Described from Armenia. Type in Tbilisi.

8. **S. lapponica** Wither. Syst. Arrang. Brit. pl. ed. 3, III (1796) 728; id. ed. 5, III (1812) 897; Fellm. Pl. vasc. Lapp. orient. sp. nov. (1864–1869) 35; Mishkin, Fl. Khib. Gor. (1953) 66; Juzepcz. in Spisok Rast. Gerb. Fl. SSSR, XIII (1955) 95. —*S. virgaurea* L. quoad pl. lapp.; Wahlb. Fl. lapp. (1812) 210. —*S. virgaurea* β. *lapponica* Wahlb. Fl. Suec. II (1833) 545; K. Regel in Vestn. Russk. Fl. II, 3 (1916) 145. —*S. virgaurea* δ. *lapponica* Ldb. Fl. Ross. II, 2 (1845–1846) 494. —*S. virgaurea lapponica* C. Rgl. in Fedde, Repert. Beih. LXXXII, 1 (1935) 108. —*S. virgaurea* ssp. *lapponica* C. Rgl. in herb. —*S. virga aurea* var. *arctica* Fellm. op. cit. pag. 36, non DC. —*S. virgaurea* γ. *arctica* Hartm. Handl. Skand. Fl. (1870) 10, non DC.; Mela Caj. Suom. Kasv. (1906) 564. —*S. virgaurea* f. *subglabra* Neum. in Bot. Notis. 6 (1896) 279; idem Sverig. Fl. (1901) 37, p. p. —*S. virgaurea* var. *alpestris* Simmons in Ark. f. Bot. 6, 17 (1907) 30, non Rchb. nec *S. alpestris* W.K.—*S. virgaurea* var. *minima* Simmons ibid. non *S. minuta* L.—**Ic.**: 42 Wither. op. cit. ed. 5, III (1812) tab. 34; ed. 6, II (1818) tab. 30; ed. 5, III (1830) tab. 33. —**Exs.**: GRF No. 3946.

Perennial. Stems 8–30(60) cm high, shorter as compared to *S. virgaurea*, erect, simple, thick, pale or somewhat reddish. Basal leaves usually short and wide, ovate, often distinctly orbicular, decurrent on winged petiole usually persisting up to fruiting, toothed, or obtusely notched; cauline leaves ovate or ovate-lanceolate, upper leaves lanceolate, sessile, glabrous on dorsal surface or slightly pubescent on midrib, entire or somewhat toothed. Inflorescence simple or weakly branched, lax panicle; capitula comparatively less numerous, 3–25 (usually about 10), solitary, axillary, usually with well developed peduncles up to 2.5 cm long or less often on few-flowered, mostly considerably spreading, shortened branches, much larger than in *S. virgaurea* (about 1.5 cm long and 2.0 cm wide). Involucral bracts in few rows (usually three), lanceolate, acute or subacute, often uniformly colored (green). Ligules also larger than in *S. virgaurea*, up to 1 cm long and 2 mm wide. Achenes about 3 mm long, hairy to tip; pappus approximately two times as long as achene. Flowering VII to late autumn (Plate I, Fig. 4).

Tundras and grassy patches in tundra, birch groves ("birch woods"), mixed coniferous forests. —*Arctic*: Arctic Europe (Kanin and Kolguev); *European Part:* Karelia-Lapland (Kola Peninsula). *General distribution*: Scandinavia. Described from Norway. Type, probably in London.

Note. As we already reported in *Spisok Rast. Gerb. Fl. SSSR*, XIII, on the Kola Peninsula and in Scandinavia along with the typical *S. lapponica*, one can find at many places the true *S. virgaurea* as well as all possible intermediate forms between these two species. The presence of the latter was particularly emphasized by Wahlenberg (loc. cit.) and also by C. Regel; for this reason, neither of them recognized *S. lapponica* as a species. We presume that such forms are of hybrid origin and could arise only after penetration into the range of *S. virgaurea* in the postglacial period; so far as *S. lapponica* is concerned, it evidently belongs to the group of plants "overwintering" [persisting] in Fennoscandia during the last glaciation.

9. **S. dahurica** Kitag. in Report of the Inst. Sci. Res. Manchoukuo, 1, 8 (1937) 297. —*S. virgaurea* var. *dahurica* Kitag. ibid. —*S. virgaurea* subsp. *dahurica* Kitag. in Report, vol. III, appendix 1 (1939) 472. *S. virgaurea* α. *vulgaris* Ldb. Fl. Ross. II (1844–1846) 493 p. p. —*S. sibirica* Fischer, Cat. Hort. Gorenk. ed. II (1812) 39, nomen and in herb. —**Ic**.: Kitag. op. cit Tab. III, f. 2.

Perennial. Stem tall, 25–100 cm high, erect, and straight to inflo-
43 rescence, mostly simple, glabrous in lower part, pubescent in upper part. Basal and lower cauline leaves oblong, cuneate, narrowed into long, winged petiole, acuminate, uniformly sharply serrate; cauline leaves numerous, oblong-lanceolate, long-cuneate at base, gradually decreasing toward apex in size and becoming sessile, entire, glabrous or somewhat pubescent (along veins and margins). Inflorescence similar to *S. virgaurea*, i.e., of two basic forms, but generally simpler and usually resembling f. *foliosa*, less often many-headed and compact as in f. *genuina*; peduncles generally well developed, densely pubescent; capitula, on an average, distinctly larger than in *S. virgaurea*, 1.0–1.5 cm long, involucre 8–10 mm long. Involucre four-rowed, bright green; bracts broadly ovate to narrowly linear, outer bracts up to 2 mm long, membranous along margins, obtusely acuminate, subacute or acute. Achenes hairy in upper one-third to half, glabrous or almost glabrous below; pappus well developed, two times as long as achene. Flowering VI–IX.

Forests (coniferous and small-leaved), forest openings. —*Western Siberia*: Altai; *Eastern Siberia*: Yenisei, Angara-Sayans, Dauria, Lena-Kolyma; *Soviet Central Asia*: Dzhungaria-Tarbagatai, Tien Shan. *General distribution*: Mongolia, China (northwestern Manchuria). Described from Nerchinsk. Type, probably, in Tokyo; isotype in Leningrad.

Note. An excellent species with a huge geographical range which had been completely overlooked by our floristic botanists until very recently and was described for the first time by the Japanese scientist Kitagawa, who, however, understated the range. Moreover, it was also noticed by Fischer in his time, but he did not publish a description; and the name given by him (which is, by the way, more appropriate than the name given by Kitagawa) appeared in the literature as a "nomen nudum." Fischer's chirotype [sic.] is preserved in the herbarium of the Botanical Institute and is from the Altai; no doubt, it is related to *S. dahurica*, the detailed description and illustration of which are faultless. In the nature of the pubescence of the achenes *S. dahurica* is intermediate between *S. virgaurea* L. and *S. pacifica* Juz.; however, it is not a simple, intermediate form, but possesses a number of distinctive features.

10. **S. gebleri** Juz. n. sp. in Addenda XXIV, 576.— *S. pumila* C.A.M. in sched., non Pers. (quae est *S. alpestris* Kit.). —*S. virga aurea* var. *alpestris* Kryl. Fl. Zap. Sib. XI (1949) 9639, non DC.

Perennial. Stem short, 10–25(40) cm high, comparatively weak, erect or somewhat ascending, often flexuous, puberulent (particularly in lower part) [or] glabrous. Basal leaves long-petiolate, most cauline leaves with rather long, winged petioles, uppermost cauline leaves usually sessile, but mostly obtuse, acute or subacute, entire or basal and lower 44 cauline leaves often with indistinct teeth; cauline leaves mostly bent; all leaves mostly glabrous, ciliate only along margins. Inflorescence as poorly developed, narrow and generally compressed raceme, consisting of less numerous (5–15) close-set capitula borne on short pubescent peduncles. Capitula comparatively large, involucre in few rows; bracts acute. Limbs of ligulate florets narrow. Achenes hairy in upper half, glabrous in lower half.

Alpine (moss-lichen) tundras. —*Western Siberia*: Altai. Endemic. Described from the Korgonskie and Ridderskie mountains. Type in Leningrad.

Note. This plant clearly stands in the same relationship to *S. dahurica* as *S. alpestris* W. and K. and *S. caucasica* Kem.-Nat. to *S. virgaurea* L. One can expect that it will be found to be much more widely distributed within Asia than is known so far.

11. **S. kuhistanica** M. Pop. in Addenda XXIV, 576. — *S. virgaurea* auct. non L.: O. and B. Fedtsch. Consp. Fl. Turkest. 4 (1911) 167 p. p., Popov in Tr. Uzbeksk. Gos. Univ., Biol., No. 14 (1941) 66.

Perennial. Rhizome thick, branched; stem 20–50 cm high, thick, generally flexuous, angular, pale green or sometimes slightly reddish, glabrous, somewhat hairy upward, pubescent in inflorescence. Basal leaves broadly elliptical or almost orbicular, obtuse, glabrous, abruptly narrowed into long, winged petiole, strongly and coarsely sharp-toothed, thin, glabrous; cauline leaves few, broadly elliptical, or broadly ovate, obtuse or upper ones subacute, with gradually reduced, winged petioles, upper leaves sessile, all coarsely and obtusely toothed, glabrous, ciliate only along margins. Inflorescence loose raceme, generally consisting of a few capitula borne on short, somewhat hairy peduncles; capitula rather large, about 12 mm long; involucre about 7 mm long, three-rowed, involucral bracts pale green, obtuse, glabrous. Ligules about 7 mm long, 2 mm wide. Achenes comparatively large, about 5 mm long, sparsely hairy only in upper part, glabrous in remaining part.

Alpine and subalpine mountain zones, in meadows and on moist rocks. —*Soviet Central Asia*: Tien Shan (west), Pamiro-Alai. Described from the upper Zeravshan (Kukhistan—basin of the Fon River north of Lake Iskander and Lake Karakul). Type and isotype in Leningrad.

12. **S. pacifica** Juz. n. sp. in Addenda XXIV, 576.— *S. virga aurea* auct. fl. or. extr.: Maxim. Prim. Fl. Amur. (1859) 149; Kom. Fl. Manchzh. III (1907) 583; Nakai in Journ. of the College of Sc. Tokyo, Japan, XXXI (1911) 6. — *S. virgaurea* var. *coreana* Nakai in Tokyo Botan. Magaz. XXXI (1917) 110; id. Fl. Silv. Cor. XIV (1923) 122; id. in Bull. of the Nat. Sc. Mus. 31 (1952) 120. —*S. virgaurea* var. *leiocarpa* Nakai in Bull. of the Nat. Sc. Mus. No. 31 (1952) 119, non A. Gray.

Perennial. Roots filiform. Stem 20–60 cm high, stout, erect, straight or flexuous, simple, angular, glabrous, sparsely leafy. Leaves on winged 45 petioles, oblong or lanceolate, acuminate, irregularly finely toothed; upper leaves as well as leaves in inflorescence usually entire, glabrous or somewhat pubescent (particularly along margins). Inflorescence generally narrow and long, spreading, formed by short and compact, often many-headed densely pubescent branches, less often close-set, forming compact raceme; bracts small, lanceolate; capitula not large, about 7–12 mm long. Involucres (three-) four-rowed, 4–6 mm long, loose; involucral bracts membranous, pale with very narrow green stripe in middle, quite obtuse (as if rounded at apex). Ligules about 5 mm long. Achenes small, about 2 mm long, entirely glabrous. Flowering VII–IX. (Plate I, Fig. 1).

Pine woods, broad-leaved and mixed forests, shrubs. —*Far East*: Zeya-Bureya, Ussuri, Sakhalin (Kuril Islands). *General distribution*: Japan, China, Described from Ussuri Territory. Type in Leningrad.

Note. It is an already well described species, which, however, is not yet recognized by taxonomists, one of whom erroneously took it for *S. virgaurea* and others (in particular, Hultén) for *S. virgaurea* var. *leiocarpa*

A. Gray. It must be noted that the description of "*S. virgaurea*" in the Flora of Manchuria nicely matches our plant, and, on the contrary, does not fit at all that of *S. virgaurea* from Europe.

We are giving an entirely new name to this species. It is possible, however, that it may have a prior name, because some species of goldenrods, described from Japan and Korea, remained totally unclear to us, given the unsatisfactory descriptions and the absence of herbarium material.

13. **S. kurilensis** Juz. nov. spec. in Addenda XXIV, 577.

Perennial. Plants of medium size; stem 15–50 cm high, erect, sinuate, glabrous or hairy at tip, densely leafy. Leaves broadly lanceolate, long and finely acuminate, gradually narrowed into long, narrow-winged petiole, uppermost leaves almost sessile, finely serrate throughout, puberulent. Inflorescence many-headed, compact, turbinate, consisting of many-headed compact branches; capitula comparatively small, 5 mm long, sessile. Involucral bracts narrow, subacute. Ovary glabrous; mature achenes not known.

Grassy patches, slopes of mountains. *Far East*: Sakhalin (Kuril Islands). Described from Shikotan Island. Type in Leningrad.

14. **S. spiraeifolia** Fisch. ex Herd. in Bull. Soc. Nat. Mosc. 38 (1865) 395 (see. p. 27). —*S. virgaurea* E. *arctica* Herd. ibid. p. p.
46 (quoad pl. e Kamtschatka) non DC. —*S. virgaurea* var. *leiocarpa* Hulten, Fl. of Kamtch. IV (1930) 153 s. str., non *Amphitropis leiocarpa* Benth. = *S. virgaurea* var. *leiocarpa* A. Gray (in Mem. Amer. Acad. N. ser. vol. VI, pt. 1 (1857) 395 = *S. cantonensis* Lour.!). —*S. virga aurea* Kom. Fl. P-ova Kamch. III (1930) 119 non L.

Perennial. Stem of medium height, 15–50 cm, high, erect, straight or sinuate, simple, angular, glabrous in lower part short-tomentose upward (particularly in inflorescence), often somewhat red, usually with sparse and spreading foliage. Basal leaves obovate, gradually narrowed into long petiole; cauline leaves with gradually reduced petioles, lanceolate, obtuse to long acuminate; lower leaves obtusely toothed, upper leaves sharply toothed, more or less pubescent. Inflorescence of few capitula, comparatively simple, loose, often compressed only in young stage; capitula comparatively large, up to 2 cm wide, with well developed, sometimes rather long, densely pubescent peduncles. Involucre up to 8 mm long; involucral bracts two-rowed, bright green, ovate-lanceolate, acute or subacute, compact, glabrous or somewhat pubescent. Ligules 5–8 mm long, narrow. Achenes 3 mm long, wholly glabrous or individual achenes with a few hairs at very tip.

Meadows, birch forests, older groves. —*Far East*: Kamchatka (from the Commander Islands), Okhotsk. Endemic. Described from Kamchatka. Type in Leningrad.

Note. Hultén was certainly not correct when he wrote (op. cit., page 156) that the Kamchatka specimens compare well with Scandinavian specimens of *S. virgaurea* with the exception of only one character, namely, the pubescence of the achenes (if, indeed, he did not have in mind Scandinavian specimens of *S. lapponica* Wither., which, in fact, sometimes greatly resemble *S. spiraeifolia* Fisch. in their external appearance).

15. **S. cuprea** Juz. nov. spec. in Addenda XXIV, 577. —*S. virga aurea* var. *beringensis* V. Vasil. in sched.— *S. leiocarpa* V. Vasil. in sched. non. DC.

Perennial. Short plants, 17–25 cm high; stem erect, straight, angular, glabrous below, densely pubescent above, with two types of leaves: basal and lower cauline leaves broadly ovate or elliptical, acute, rounded at base, obtuse or abruptly narrowed into broadly winged petiole, coarse-toothed, teeth obliquely triangular, long pointed, with C-shaped, curved, outer margin; upper cauline leaves broadly lanceolate, long acuminate, gradually cuneately narrowed at base, sessile, serrate. Inflorescence with few heads, loose; capitula about 1 cm long, in clusters of one to three, in axil of upper cauline leaves, on long peduncles. Involucres about 5 mm long; bracts ovate-lanceolate, acute. Achenes glabrous.

47 Meadows. *Far East*: Kamchatka (Commander Islands). Described from Mednyi Island (from the village of Preobrazhenskoe).

Note. The form is known from inadequate material and needs to be studied further.

Series 2. Multiradiatae Juz. —Cauline leaves almost sessile. Ligulate florets 8–12. Inflorescence globosely capitate.

16. **S. compacta** Turcz. in Bull. Soc. Nat. Mosc. XIII (1840) 73. —*S. capitata* Fisch. in herb. and ex Herd. in Bull. Soc. Nat. Mosc. II (1865) 395 (nomen in synonymia). —*S. unalaschensis* Gandog. in Bull. Soc. Bot. France LXV (1918) 47. —*S. virga aurea* M. *arctica* DC. Prodr. V (1836) 339. —*S. arctica* V. Vass. in Herb. —*S. multiradiata* A. Gray, Synopt. Fl. of N. Amer. I, p. 2 (1884) 177 and ed. 2 (1886) 147 p. p. non Ait.: Kom. Fl. Kamch. III (1930) 119 p. p. (quoad pl. e "Chukotskii Krai"), non Ait. —*S. multiradiata* var. *arctica* Fernald in Rhodora 17 (1915) 4; Hulten Fl. Aleut. Isl. (1937) 314. —*S. virgaurea* Less. in Linnaea 6 (1831) 126, non. L. —*S. virgaurea* γ. *multiradiata* Torr. and Gr. Fl. bor. Am. II (1841–1843) 207 p. p. —*S. virgaurea* ε.

arctica Ldb. Fl. Ross. II (1844) 493; Herd. in Bull. Soc. Nat. Mosc. 38, 1 (1864) 395 p. p. (see p. 27). —*S. confertiflora* Ldb. fl. Ross. II (1844) 494 p. p. (quoad pl. ex Unalaschka); Herder in Bull. Soc. Nat. Mosc. 38, 1 (1864) 395; Rothrock, Sketch Fl. Alaska (1867) 448, non. DC.

Perennial. Stem 5–30 cm high, usually somewhat ascending at base, often sinuate, angular, reddish, and slightly pubescent to almost glabrous in lower part, more or less hairy above; usually densely pilose or tomentose in inflorescence. Basal leaves spatulate, gradually narrowed into short petioles, at tip rounded, obtusely or sharply toothed on outer margin; cauline leaves few, spreading, rather densely hairy along margin with long hairs; lower leaves narrow, oblong-obovate, cuneately narrowed into petiole; obtuse or subacute, less toothed; upper leaves lanceolate, entire, uppermost leaves often compactly closing on inflorescence. Inflorescence very compressed, globosely capitate, 2.0–3.5 cm wide, consisting of 5–20 densely clustered capitula borne on greatly shortened peduncles, with narrow, linearly lanceolate bracts, densely pubescent along margins. Capitula small, with 4–6 mm long involucre; involucral bracts linearly lanceolate, subacute or acute, finely hairy only along margin, rest glabrous. Ligulate florets (6)8–12; ligules short, about 3 mm long, very narrow. Achenes short, densely and appressed hairy. Flowering VIII (Plate I, Fig. 2).

Tundras. —*Far East*: Chukotka. *General distribution*: North America (Alaska, Unalaska). Described from Unalaska Island. Type in Leningrad.

48 *Section* 2. PANICULATAE A. Gray in Proc. Amer. Acad. XVII (1882) 191. —Capitula mostly small, 5–6 mm long, in broad panicles or compound racemes, branches secund.

This section includes a large number of species from North America, some of which have been brought under cultivation in our country as oranmental plants and of late also as rubber-producing plants. Important literature, although very brief and incomplete, has been devoted to the study of rubber producing species of goldenrods, of which *S. leavenworthii* sic.; *leavenworthii* Torr. and Gray is particularly recognised. A summary is given in the compendium *Kauchuk i Kauchukonosy* [Rubber and Rubber Producing Plants], II, 1953; we refer those who are interested to it.

A number of ornamental and rubber-producing species of this group grow wild in different parts of the USSR and in the Caucasus. Here we present a brief review of these species because of their mention in the literature; however, the information available about them is evidently inadequate and partly unreliable as well.

***S. serotina** Ait. Hort. Kew. ed. I, III (1789) 211.—**Ic.**: Hegi, Ill. Fl. VI, 1, 412.

Perennial. Rhizome procumbent; stem 50–250 cm high, erect, glabrous. Leaves numerous, lanceolate, long acuminate, sharply toothed, glabrous or somewhat pubescent along veins on dorsal side. Inflorescence—pyramidal panicle; its branches arcuate, secund. Capitula rather numerous, 5–6 mm long, on short peduncles. Involucre 3.25–4 mm long; involucral bracts linearly lanceolate, obtuse. Florets golden yellow; ligules of ray florets linear, slightly longer than involucre. Flowering VIII–IX.

An ornamental North American plant, found at places naturalised—*European Part*: Upper Dniester. *General distribution*: Western Europe (wild), North America. Described from North America.

17. **S. canadensis** L. Sp. pl. (1753) 879; Syreistsch. Ill. Fl. Mosk. Gub. III, 238; Grossh. Opredel. Rast. Kavk., 438; Kolak. Fl. Abkh. IV, 194; Vizn. Rosl. URSR, 522.—**Ic.**: Syreistsch. op. cit. page 239; Hegi, Ill. Fl. VI, 412, fig. 212.

Perennial. Rhizome procumbent, branched; stem (0.6)1.5–2.5 m high, erect, simple up to inflorescence, green, slightly pubescent. Leaves numerous, lanceolate or linearly lanceolate, gradually decreasing in size upward, narrowed toward both ends, acuminate; lower leaves sharply serrate-toothed, often entire at base; upper leaves entire with three longitudinal veins of which two not very prominent, ventral side glabrous or pubescent, dorsal side somewhat hairy. Capitula small, 4–6 mm long, in strongly secund, arcuate racemes forming spreading pyramidal panicles. Involucre 2.3–4.0 mm long; involucral bracts linearly lanceolate, obtuse. Florets golden-yellow, peripheral (ligulate) florets very small, very slightly longer than involucre. Flowering VIII–IX.

49 Widely cultivated plant, often naturalised—*European Part*: Baltic republics, Ladoga-Ilmen, Middle Dniester; *Caucasus*: Western Transcaucasia. *General distribution*: Western Europe (wild), North America. Described from Canada. Type in London.

Economic Importance. An ornamental and rubber-producing plant.

***S. rupestris** Raf. Ann. Nat. (1820) 14; Grossh. Opredel. Rast. Kavk. 438; Kolak. Fl. Abkh. IV, 195.

Perennial. Stem up to 150 cm high, erect, slender, not colored or violet in lower part. Leaves narrow, linearly lanceolate, with single prominent vein, remotely sharply serrate, acutely scabrous, glabrous. Inflorescence racemose-paniculate, as small, loose panicle. Involucral bracts almost linear, very dissimilar; corolla golden-yellow. Flowering VII–IX.

Introduced and escaped. —*Caucasus*: Western Transcaucasia (Gulripsh). *General distribution*: North America. Described from North America.

Economic Importance. An ornamental and rubber-producing plant.

***S. arguta** Ait. Hort. Kew. ed. 1, III (1789) 213; Grossh. Opredel. Rast. Kavk. 439; Kolak. Fl. Abkh. IV, 194.

Perennial. Stem 40–60 cm high, erect, usually branched in upper half, glabrous, reddish. Lower leaves oblong-ovate, decurrent on winged petiole, middle leaves oblong-lanceolate, acuminate, upper leaves sessile, broadly lanceolate, serrate, glabrous. Inflorescence racemose, branches clustered into groups, lower branches short; capitula small. Involucres 3–4 mm long, bracts linearly lanceolate, unequal in length. Ligulate florets not longer than involucre. Flowering VII–IX.

Introduced. *Caucasus*: Western Transcaucasia (Sukhumi). *General distribution*: North America. Described from America. Type in London.

Economic Importance. An ornamental and rubber-producing plant.

***S. neglecta** Torr. and Gr. Fl. N. Amer. II (1841–1843) 213; Grossh. Opredel. Rast. Kavk. 439; Kolak. Fl. Abkh. IV, 194.

Perennial. Stems 50–60 cm high, generally few, erect, violet-colored due to anthocyanin. Basal leaves long-petiolate, oblong-lanceolate, broadly decurrent, serrate and somewhat pubescent along margins, rest glabrous; cauline leaves oblong-lanceolate, sessile, gradually decreasing in size upward, remotely serrate-toothed. Inflorescence paniculate, rather compact. Involucre imbricate, bracts elliptical or oblong; ligules of peripheral florets one-third as long as involucre, golden-yellow. Flowering VII–IX.

Introduced and escaped. —*Caucasus*: Western Transcaucasia (Gulripsh). *General distribution*: North America.

Economic Importance. An oranmental and rubber-producing plant.

50 ***S. juncea** Ait. Hort. Kew. ed. 1, III (1789) 213; Grossh. Opredel. Rast. Kavk. 439; Kolak. Fl. Abkh. IV, 195.

Perennial. Stems up to 2.5 m high, erect, branched, in upper part, generally reddish-violet, glabrous. Leaves short-petiolate, broadly elliptical or ovate-lanceolate to lanceolate, narrowed toward both ends, serrate-toothed glabrous, finely ciliate along margins. Inflorescence spicate-paniculate, spreading, loose. Involucral bracts elliptical and oblong, obtuse; ligulate flowers somewhat projected from involucre, bright yellow. Flowering VII–IX.

Introduced and escaped. —*Caucasus*: Western Transcaucasia (Gulripsh). *General distribution*: North America. Described from North America. Type in London.

*__S. odora__ Ait. Hort. Kew. ed. 1, III (1789) 214; Grossh. Opredel. Rast. Kavk. 438; Kolak. Fl. Abkh. IV, 195.

Perennial. Stems up to 2.5 m high, erect, generally reddish-violet, glabrous. Leaves linearly lanceolate with single prominent vein, entire, or with occasional teeth, glabrous or sharply scabrous along margin. Inflorescence spicate-paniculate, short, clustered. Involucral bracts elliptical or oblong, obtuse; flowers golden-yellow; ligules of peripheral florets almost half as long as involucre. Flowering VII–IX.

Introduced and escaped. —*Caucasus*: Western Transcaucasia (Gulripsh). *General distribution*: North America. Described from North America. Type in London.

Economic Importance. An ornamental plant; in America it is considered as a medicinal plant.

Subgenus II. **Euthamia** Ell. Sketch. Bot. South.-Carol. II (1824) 391. —Ligulate florets generally larger than disk florets. Capitula sessile, clustered into compact inflorescence. Involucral bracts flat, somewhat sticky.

*__S. graminifolia__ (L.) Ell. Sketch. Bot. South.-Carol. II (1824) 391. —*Chorysocoma graminifolia* L. Sp. pl. (1753) 841.

Perennial. Rhizome cylindrical, producing creeping shoots; stems 60–70 cm high, erect, simple up to inflorescence, glabrous or somewhat scabrous in lower part. Cauline leaves numerous, linearly lanceolate, acute, narrowed toward base, entire, three-veined, hairy and scabrous along margin and on dorsal side on veins, rest glabrous. Inflorescence consisting of densely borne pseudo-umbels; capitula almost sessile, turbinate, 5–6 mm long. Involucral bracts imbricate, oblong-lanceolate, convex, somewhat thickened and green at apex; florets golden-yellow; ligulate florets not longer than disk florets. Flowering from July to mid-autumn.

Cultivated plant, readily escaped. —*European Part*: Upper Dniester. *General distribution*: Central Europe (wild), North America. Described from North America. Type in London.

Economic Importance: An ornamental plant.

51 Subtribe 2. **GRANGEINAE** Cass. in Dict. Sc. Nat. LX (1830) 58, p. p.; O. Hoffm. in Pflanzenfam. IV, 5 (1889–1894) 152. —All florets in capitulum tubular, peripheral florets pistillate, tubular or filiform, generally in two or more whorls. Style branches usually exserted. Herbaceous plants, generally bearing small capitula.

GENUS 1456. **Dichrocephala** L'Hér. [1,2]

L'Hér. Archive d. Bot. 2 (1833) 517; DC. Prodr. V (1836) 371

Capitula small, heterogamous, oblong or round, solitary or racemosely clustered. Involucral bracts almost one-rowed, flattened, somewhat toothed. Receptacle convex, glabrous. Florets all tubular, peripheral pistillate, in several whorls, central ones bisexual, oblong-campanulate, both types fertile. Corolla three- or four-toothed. Anthers obtuse at base. Style exserted, stigma lobes short, more or less lanceolate. Achenes compressed; in pistillate flowers without pappus, in bisexual flowers with one or two small bristles and vein along margin.

Annual herbs with alternate entire or lyrate leaves.

Of the five or six species found in Africa and tropical Asia we have one.

1. **D. bicolor** (Roth.) Schltd. in Linnaea XXV (1852) 209. —*D. latifolia* (Lam.) DC. Prodr. V (1836) 371. —*D. sonchifolia* DC. ibid. —*Cotula bicolor* Roth. Catalect. f. II (1800) 116. —*C. sonchifolia* MB. Fl. taur.-cauc. II (1808) 328. —*Grangaea latifolia* Lam. ex Poir. Encycl. suppl. II (1811) 826.

Annual. Plant 20–80 cm high; roots fasciculate. Stems loosely branched, solitary, slightly angular, glabrescent, sometimes somewhat scabrous. Lower leaves long-petiolate, entire, ovate or cordate; upper and middle leaves mostly lyrate, lamina almost glabrous or slightly pubescent, crenate or double crenate-toothed, with isolated long hairs along somewhat prominent veins; uppermost leaves greatly reduced. Capitula rather numerous, hemispherical, in loose panicles, axillary or terminal, 3–4 mm wide; involucral bracts small, somewhat ciliate, green; corolla of pistillate flowers tubular. Achenes glabrous, greatly compressed, very small, obovoid, with more compact edge. Flowering VI–IX. (Plate II, Fig. 3).

52 Damp forests, herb ravines and forests, sometimes as weeds. —*Caucasus*: Western and eastern Transcaucasia, Talysh. *General distribution*: Africa, India. Described from Island of Java. Type in Paris.

Economic Importance. Used as vegetable in Abyssinia.

Subtribe 3. **BELLIDINAE** O. Hoffm. in Pflanzenfam. IV, 5 (1889–1894) 154. —Peripheral florets pistillate, ligulate, with white or differently colored ligule, yellowish as an exception. Pappus absent or greatly reduced, sometimes somewhat coronate.

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[1] Treatment by S.G. Tamamschjan.

[2] The name is derived from the Greek words *dichros*—bi-colored, and *kephale*—head.

GENUS 1457. **Myriactis** Less. [1,2]

Less. in Linnaea VII (1831) 127. —*Botryadenia* Fisch. and Mey. in Ind. Sem. II Petrop. (1835) 30

Capitula very small, not more than 1 cm wide, on long dichotomously spreading peduncles, heterogamous. Involucre hemispherical, in one or two rows of herbaceous bracts. Receptacle flat or slightly convex with small ridges. Outer (ray) florets ligulate, pistillate, in two or many whorls; ligules very curled when dry. Disk florets tubular, four-lobed, bisexual. Achenes compressed along margin, coriaceous, slightly attenuate upward into beak or coronate, without pappus.

Annual or biennial, erect, sparsely branched herbs.

The genus includes two or three species known from India and Indonesia; one of them is found with us.

1. **M. gmelinii** (Fisch. and Mey.) DC. Prodr. V (1836) 308; Ldb. Fl. Ross. II, 492; Grossh. Opredel. Rast. Kavk. 939. —*Botryadenia gmelini* Fisch. and Mey. in Ind. II Sem. Petrop. (1835) 30.

Annual or biennial. Stem erect, apically branched and with scattered glandular hairs. Leaves oblong-rhomboidal, cuspidate or acuminate, coarse-toothed, obtuse at base, notched, or cuneate, abruptly or gradually narrowed into petiole; upper leaves small, entire, lanceolate. Peduncles long, slender, straight, terminal with solitary capitula. Involucral bracts almost two-rowed, leafy, appressed, linear, with narrow, dry membranous margin, obtuse or more or less acuminate with scaly appendage ciliate at end; ligulate flowers two- or three-rowed, very slightly exceeding involucral bracts, yellowish or bluish. Achenes without pappus, oblong-obovate, sometimes somewhat attenuate, with annular thickening at base and spherical lobed appendage at tip, glabrous. (Plate II, Fig. 1).

53 Forests in the middle montane zone. —*Caucasus*: Western and eastern Transcaucasia. *Soviet Central Asia*: Pamiro-Alai. *General distribution*: India—the Himalayas, Iran. Described from Iran. Type in Leningrad.

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[1] Treatment by S.G. Tamamschjan.

[2] From the Greek words *Myrios*—innumerable, and *aktis*—ray.

GENUS 1458. **Bellis** L.[1,2]

L. Sp. pl. (1753) 886

Capitula solitary, up to 30 mm wide; heterogamous. Involucre hemispherical; involucral bracts herbaceous, two-rowed, almost uniform, elliptical or much longer, generally obtuse, hairy. Receptacle short, conical, alveolate. Disk up to 5 mm or more wide. Disk florets numerous, with yellow tubular corolla, bisexual. Peripheral florets pistillate, one-whorled, with white (sometimes pinkish or reddish) ligulate corolla, much longer than involucre. Anthers obtuse at base, filaments decurrent, appendages of flat stigmatic branches triangular. Achenes ovoid, externally compressed, smooth, with marginal veins. Pappus absent. Perennial or annual herbs, 2–15 cm high, with rosette of spatulate or spatulate-obovate leaves at base of peduncles.

Of the 10 species distributed in Europe, Asia Minor, Syria, and North America, we have two.

1. Small plants, not more than 5–6 cm high with thin stems; leaves oblong-obovate; capitula three to six, generally small, 5–15 mm wide..1. **B. hyrcanica** Woron.
+ Plants larger. All leaves in rosette spatulate; capitula more than 15 mm wide..2. **B. perennis** L.

1. **B. hyrcanica** Woron. in Woron. and Schelk. Sched. ad Herb. Fl. Cauc. Fasc. VIII (1916) 70; Grossh. Opredel. Rast. Kavk. (1949) 439.

Annual. Stems very thin, short, with glandular scaly bristles. Lower leaves long-spatulate, sometimes slightly emarginate, 1–2 cm long, 0.3–0.5 mm [sic. ; recte cm] wide. Middle and upper leaves oblong-obovate, obtuse, with occasional bristles on surface and ciliate margin, with prominent midrib on dorsal side. Peduncles somewhat covered with white bristles, becoming considerably thicker during fruit formation. Involucral bracts ovate, dorsally glabrous, along margins ciliate, with tuft of small bristles at tip, obtuse, with three veins convergent tip. Ligulate florets white, at base with tuft of hairs, two times as long as 54 involucre. Achenes small, up to 1 mm long, along edge slightly thickened, compressed, pubescent, apically notched, yellowish. Flowering III–IV.

Forest and meadows. —*Caucasus*: Eastern Transcaucasia, Talysh. Endemic. Described from Lenkoran. Type in Leningrad.

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[1] Treatment by S.G. Tamamschjan.

[2] Name of the plant is found in Pliny, and it originated from the Latin epithet *bellis*, which means beautiful.

2. **B. perennis** L. Sp. pl. (1753) 886. —*B. scaposa* Gilib. Fl. Lithuan. I (1783) 213. —*B. integrifolia* DC. in Lam. Encycl. V (1789) 7, non Mich. —*B. silvestris* auct. non. Cirillo (1792). —**Ic.**: Hegi, Ill, Fl. VI, t. 258. fig. 4.

Perennial. Aerial stem generally absent, only peduncles emerging from leaf rosettes; rhizome short, inclined. Leaves in rosette spatulate or oblong-obovate, obtuse, toothed, narrowed into broad, winged petiole, usually densely pubescent with glandular and articulate stiff hairs. Peduncles few or many, usually densely setosely pubescent, less often almost glabrous, at maturity greatly thickened below capitula, two or more times as long as rosette of leaves, less often shorter. Involucral bracts elliptical or oblong, apically narrowed and with tuft of membranous cilia, dorsally with stiff hairs, along margin often narrow membranous, half as long as ray florets. Ligules white, pinkish, or reddish, with tuft of curly hairs at base. Achenes 0.5 mm long, yellow, with thickened and light-colored margin; in pistillate flowers short-hairy, but in bisexual flowers glabrous or subglabrous. Flowering V–VI. (Plate II, Fig. 2).

Damp meadows, forests, and in grassy forest openings —*European Part*: Upper Dniester; Crimea; *Caucasus*: Eastern Transcaucasia; *Soviet Central Asia*: As wild, rare plant. *General distribution*: Western Europe, Balkans-, Asia Minor. Described from Europe. Type in London.

Economic Importance. Grown in gardens as an ornamental plant.

Subtribe 4. **ASTERINAE** O. Hoffm. in Pflanzenfam. IV, 5 (1889–1894) 156. —Subtribe Heterochromeae Benth. in Benth. and Hook. f. Gen. Pl. II (1873) 177. —Peripheral florets pistillate, generally ligulate with ligules white, pink, bluish, or any other color but only very rarely yellow; less often all flowers in capitulum tubular. Pappus of bristles or hairs in one, two, or more rows, sometimes dimorphic, or slightly reduced.

57 GENUS 1459. **Boltonia** L'Hérit. [1,2]

L'Hérit. Sert. angl. (1788) 27

Capitula large, heterogamous with ligulate florets, the false ligules white, pink, or bluish. Involucral bracts imbricate with green central portion and scarious margin, stiff; outer bracts short, inner ones much longer and wide, along margin ciliate or often fimbriate. Receptacle hemispherical or somewhat broadly conical, glabrous, alveolate. Disk

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[1] Treatment by S.G. Tamamschjan.

[2] Named after the English botanist James Bolton.

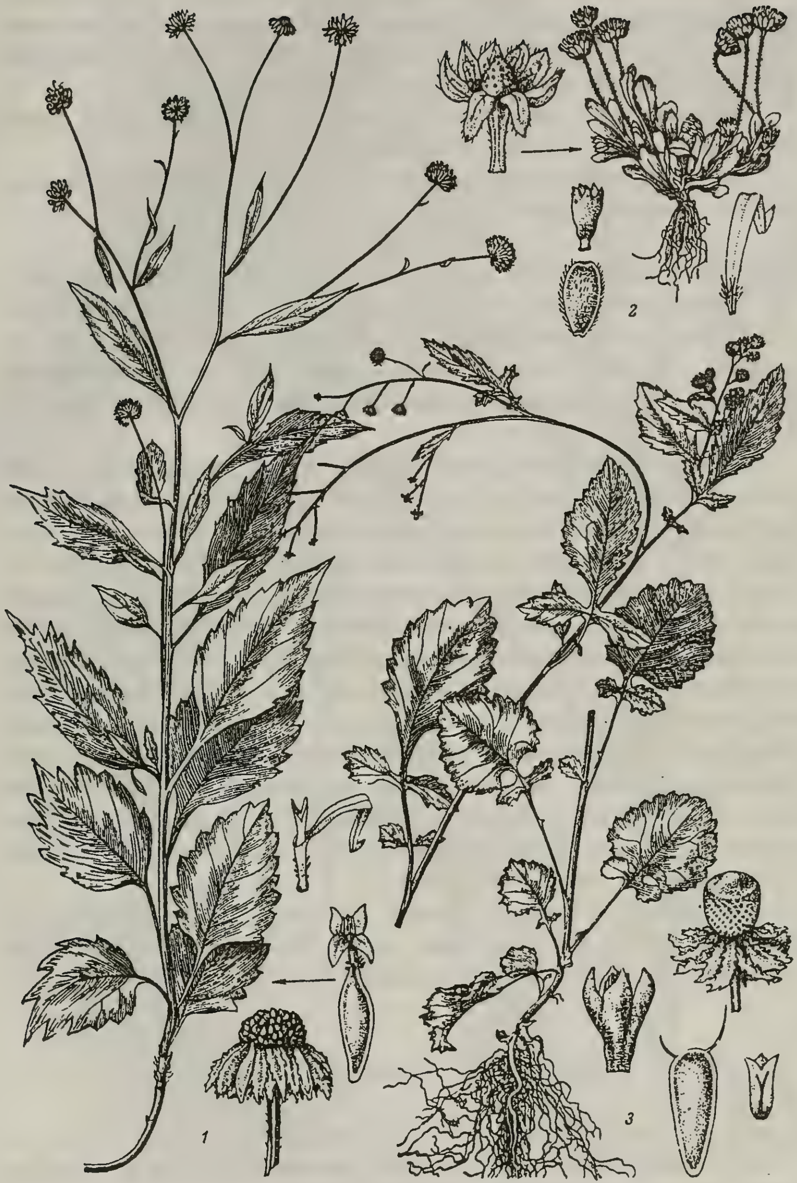

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Plate II.
1—*Myriactis gmelinii* (Fisch. and Mey.) DC., habit, capitulum with exposed peduncle, ligulate floret and achene with disk floret; 2—*Bellis perennis* L., habit, capitulum with exposed peduncle, disk florets, achenes, peripheral ligulate floret; 3—*Dichorocephala bicolor* (Roth) Schltd., habit, capitulum with exposed peduncle, bisexual floret, pistillate floret, achene of bisexual floret.

florets yellow, fertile; anther bases entire; style flat with lanceolate, hairy appendages. Achenes broadly ovoid, with more or less winged margins. Pappus of several unequal, short bristles or with two or four awnlike projections, usually reduced in peripheral florets.

Perennial herbs sometimes stoloniferous, with stiff, rough, entire leaves and a small number of capitula.

The genus includes eight or nine species distributed in North America and one in eastern Asia.

1. **B. lautureana** Deb. in Actes soc. Linn. de Bord. XXXIII (1879) 76. —*Aster lautureanus* Franch. in Mém. Soc. Nat. Cherburg XXIV (1884) 224; Forbes and Hemsl. Ind. Fl. Sin. I (1888) 413; Kom. Fl. Manchzh. III (1907) 599. —*Calimeris integrifolia* var. *scabra* Maxim. in sched. —*C. lautureana* Kitamura in Acta Phytotax. et Geob. VI (1937) 22.

Perennial. Stem simple or branched above, straight, cylindrical, 70–80 cm high, slightly angular, with stiff bristles along edges, at base almost glabrous. Leaves coriaceous, ovate-lanceolate or linearly lanceolate, all or upper leaves undivided; lower leaves coarsely toothed with revolute margin, dark brown or dark green, scabrous all along margin, bristly, small-toothed, and prickly; ventral surface scabrously glandular, dorsal surface glabrous, except midrib covered with stiff uncinate hairs. Capitula terminal, solitary at tip of branches, about 2 cm wide; ligulate florets bluish. Involucral bracts unequal; inner ones broader and longer, ovate, cartilaginous, obtuse, along membranous margin ciliate-fimbriate. Achenes small, compressed, broadly ovoid, with wide margin, glabrous or somewhat hairy, along margin scabrous; pappus of short or unequal, chestnut-colored hairs, fused at base, sometimes almost undeveloped. Flowering VII–IX. (Plate III, Fig. 2).

Meadows, rare shrubby thickets. —*Eastern Siberia*: Dauria; *Far East*: Zeya-Bureya; Uda River area, Ussuri. *General distribution*: China, Korea, Japan. Described from northern China. Type in Paris.

58 GENUS 1460. **Gymnaster** Kitamura [1, 2]

Kitamura in Mem. Coll. of Sc. Ser. B. III (1937) 301

Capitula heterogamous, medium, pedunculate, solitary. Ligulate florets one- or, less often, two-whorled, pistillate, disk florets bisexual, and both fertile. Involucre hemispherical or campanulate-spherical, bracts

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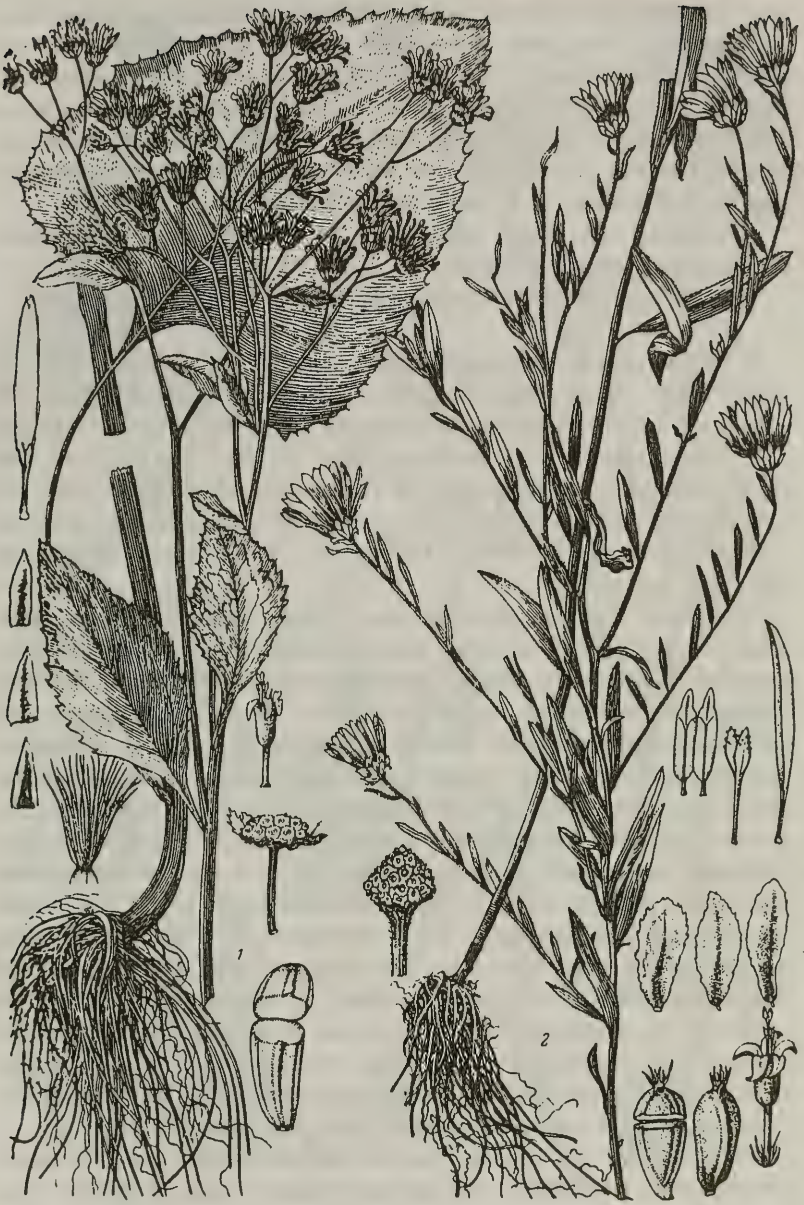
[1] Treatment by S.G. Tamamschjan.

[2] From the Greek words *gymnos* — female [sic.; recte “bare”], and *aster* — star.



59 Plate III.
1—*Doellingeria scabra* (Thunb.) Nees, habit, capitulum with exposed receptacle, ligulate peripheral floret, tips of involucral bracts, pappus, disk floret, achene; 2—*Boltonia lautureana* Deb., habit, receptacle, anthers, style branches, ligulate peripheral floret, involucral bracts, achene, disk floret.

two- or three-rowed, almost equal, imbricate, acuminate or obtuse, dorsally more or less green. Receptacle conical, alveolate, alveolae not prominent along margin. Corolla of ligulate florets blue or white, that of disk florets yellow, tubular with five teeth. Anthers at base obtuse. Style appendages lanceolate or deltoid. Achene compressed, oblong, striped, glabrous, along edges and ribbed on surface. Pappus absent or (not in our species) of a few shedding bristles.

Perennial, erect herbs with oblong or ovate, glabrous or scabrous, and sessile or petiolate leaves.

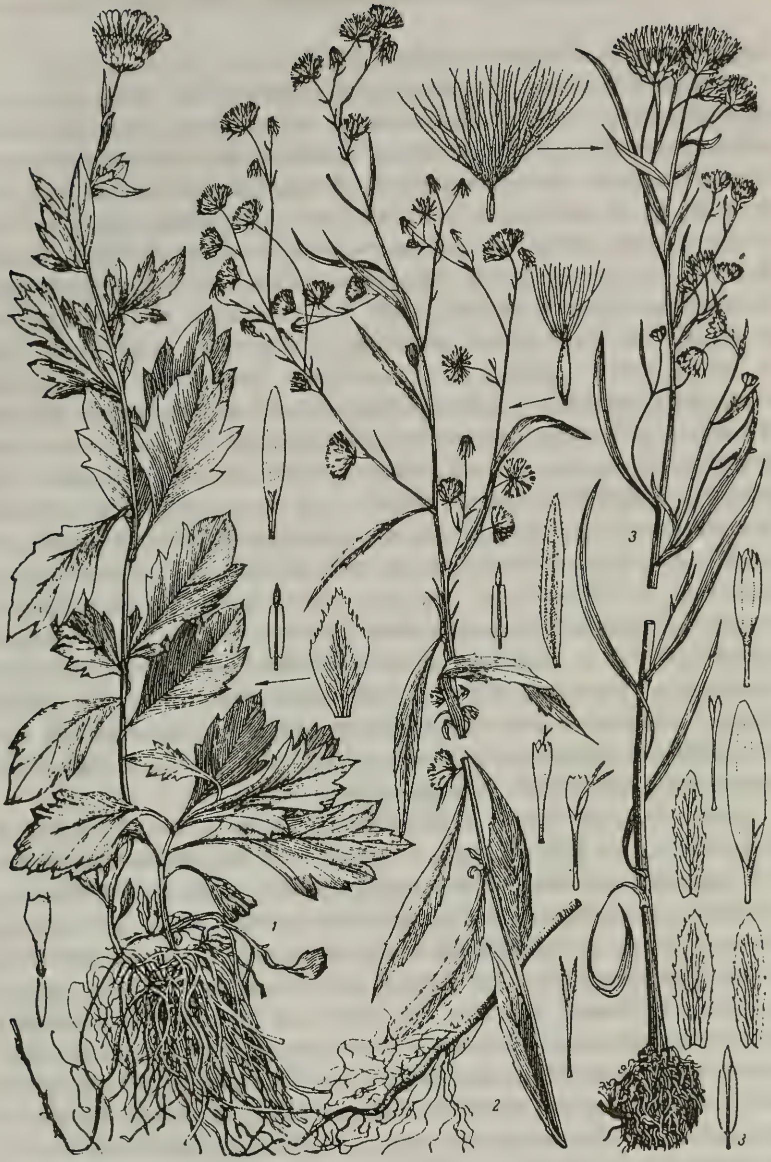
Of the several species growing in eastern Asia, we have one.

1. **G. savatieri** (Makino) Kitamura in Mem. of the Coll. of Sc. III (1937) 301. —*Asteromoea savatieri* Makino in Tokyo Bot. Mag. XII (1928) 59. —*Boltonia savatieri* Makino in Tokyo Bot. Mag. VIII (1894) 174. —*B. cantoniensis* Fr. and Sav. Enum. Pl. Jap. II (1879) 398, non DC. —*Aster savatieri* Makino in Tokyo Bot. Mag. XII (1898) 58; Somoku-Dzusetsu Makino ed. IV (1923) 967. —*Calimeris savatieri* (Makino) Grossh. Opredel. (1949) 441. —**Ic.**: Somoku-Dzusetsu Makino's, 16, pl. XLII.

Perennial. Rhizome short, prostrate, highly fibrous near root collar. Stem 20–50 cm high, straight, angular, weakly pubescent or glabrous, branched. Basal leaves on long, winged-petioles, lamina thin, oblong or oblong-ovate, sometimes roundish-triangular, ventrally dark green, dorsally much lighter, coarsely sinuate-toothed, teeth obtuse or acuminate; cauline leaves reducing toward apex, upper leaves often undivided, lanceolate, lower and middle ones rather large, coarsely sinuate-toothed, at base narrowed into petiole; lamina thin, on dorsal side sparsely
61 pubescent with small, thin hairs. Capitula on long peduncles, often paniculate, 3–4 cm wide. Involucre hemispherical, bracts two-rowed, almost equal in length, more or less attenuate above, herbaceous, along margins ciliate, inner ones often cartilaginous along margin; peripheral florets one-whorled, with bluish, pinkish, or almost white corolla; corolla tube on outside somewhat pubescent; disk florets tubular, yellow, 4.5 mm long. Achenes 3–4 mm long, oblong-obovate, at apex obtuse, narrowed downward, slightly compressed, at tip with or without rib, glabrous, without pappus. Flowering VI–VIII. (Plate IV, Fig. 1).

Introduced. In shady, moist places.—*Caucasus*; Western Transcaucasia (Adzharia). *General distribution*: Japan. Described from Japan. Type in London.

Note. A quite common weed in tea plantations. With us it flowers later than in its native land, Japan. May be used as an ornamental plant.



63 Plate IV.

1—*Gymnaster savatieri* (Makino) Kitamura, habit, disk floret with achene, ligulate peripheral floret, stamen, involucral bract; 2—*Conyzanthos* [sic.; —*thus*] *graminifolius* (Spreng.) Tamamsch., habit, achene with pappus, stamen, involucral bract, tubular floret, tubular-ligulate floret, style; 3—*Tripolium vulgare* Nees, habit, achene withpappus, disk floret, peripheral ligulate floret, style, involucral bract, stamen.

GENUS 1461. **Heteropappus** Less. [1,2]

Lessing, Synops. Compos. (1832) 189

Capitula medium (1.5 cm wide) to large (3–5 cm wide) in corymbose-paniculate, more or less compact inflorescence; heterochromous and heterogamous, usually at end of branches. Involucre hemispherical, involucral bracts often two- or three-rowed, less often four-rowed, almost all equal, indistinctly imbricate, oblong or linear, acute, entirely or only dorsally herbaceous, along margin whitish-membranous. Receptacle slightly convex or flat, alveolate, alveolae not uniformly toothed, scaly along edges or smooth. Disk florets tubular, bisexual, yellow; peripheral florets ligulate, pistillate, one-whorled, sometimes only in small number; ligules pale or dark blue, bluish, pink, or less often white. Style appendages acutely deltoid. Anthers at base obtuse. Achenes obovate or oblong-obovate, sometimes somewhat flat (i.e., compressed dorsally), with one or two on surface at upper end, covered with compressed straight white hairs. Pappus dark wine-red, brown, reddish, chestnut, smoky, or dirty-white, comprising setaceous stiff hairs, of equal length in all achenes, but not well developed in peripheral ones, consisting of sparse, short, setaceous hairs, sometimes membranous, coronate, or unequal in achenes from different whorls, so that longest pappus may be in innermost achenes of disk. Biennial or less often perennial, with rosette of first year's basal, lobate, obtusely toothed leaves, or without rosette; cauline leaves undivided, lanceolate, or narrowly elliptical, glabrous or like stem densely pubescent with stiff or soft 62 hairs, sometimes revolute along margin.

Note. Kitamura (1937, 1957) included in the genus *Heteropappus* only species with different types of pappuses in the ray and disk florets and suggested that the forms v. *longe-radiatus, villosus* and *sibiricus*, established by Komarov (1937), should be included in the genus *Aster*. However, being guided only by the structure of the pappus, Kitamura incorrectly interpreted the genus *Heteropappus*. As was earlier mentioned by Franch. (*Fl. Jap*., II, 1876) and later by Novopokrovsky (1902) and Komarov (1907, 1926), in this genus the heteropappus condition is weakly manifest, but the habit of the plants, nature of the bracts and shape of the receptacle unite a number of species and clearly distinguish them from the genus *Aster*. The genus is highly polymorphic and Komarov may be correct when he says that *Heteropappus* is not a formal generic group, but a natural series of species growing over the vast area from Japan to Tibet and Iran, including Soviet Central Asia and Siberia.

[1] Treatment by S.G. Tamamschjan.

[2] From the Greek words *heteros*—different, and *pappus*—parachute.

Economic Importance. Many species are very ornamental.

1. Plants perennial; stems usually many; involucral bracts dorsally herbaceous, but scarious along margin; pappus in all achenes similar....................2
+ Plants biennial; stems usually one or two; involucral bracts entirely herbaceous; pappus in all achenes similar or different in peripheral and central ones....................5
2. Plants 4–10 (15) cm high; stems almost prostrate or slightly ascending, sinuate, with very densely arranged, 1–3 mm wide leaves....................1. **H. distortus** (Turcz.) Tamamsch.
+ Plants more than 15 cm high, less densely leafy with much broader leaves....................3
3. Plants covered with appressed, sometimes decumbent, sparse hairs; capitula 2.5–3.5 cm wide; involucral bracts 2–3 mm wide, dorsally, besides hairs, covered with fine, sometimes yellowish, shining glands....................2. **H. altaicus** (Willd.) Novopokr.
+ Plants with dense grayish pubescence; capitula 2.0–2.5 cm wide; involucral bracts 1.0–1.5 mm wide, dorsally covered with stiff, uncinate white hairs....................4
65 4. Involucral bracts four-rowed. Stem repeatedly branched like candelabrum in upper third or half...3. **H. alberti** (Rgl.) Novopokr. and Tamamsch.
+ Involucral bracts three-rowed; stem uniformly branched from base....................4. **H. canescens** (Nees) Novopokr.
5. Achenes with different types of pappus: in peripheral ligulate florets coronate or of very short hairs; in disk florets, of long setaceous hairs....................6
+ All achenes with similar pappus; if pappus reduced in peripheral ligulate florets, then achenes undeveloped....................7
6. Pubescence appressed, inconspicuous; rhizome with stolons bearing several rosettes of basal leaves; upper leaves narrowly linear....................6. **H. pinetorum** Kom.
+ Pubescence conspicuous, of dense, spreading hairs; rhizome without stolons, and with single rosette of basal leaves; upper leaves much broader, lanceolate or oblanceolate, obtuse, or oblong-elliptical....................7. **H. hispidus** (Thunb.) Less.
7. Achenes in peripheral ligulate florets undeveloped; sometimes pappus also undeveloped; ligules three times as long as width of disk..........12. **H. meyendorfii** (Rgl. and Maack) Kom. and Alis.
+ All achenes fully developed and with similar pappus; ligules not so long....................8
8. Plants almost glabrous....................9

+ Plants pubescent with appressed, dense or sparse, distant hairs, with or without fine glands..10

9. Stem slender, 0.5 cm wide, only in upper half branched and leafy; capitulum 2.5–3 cm wide....................8. **H. saxomarinus** Kom.

+ Stem much thicker, 1.0–1.3 cm wide, densely leafy; peduncles borne uniformly along entire length of stem; capitula up to 5 cm wide..9. **H. elisabethinus** Tamamsch.

10. On leaves and particularly on involucral bracts, besides stiff whitish hairs, fine golden, punctiform glands; stems two or three..5. **H. medius** (Kryl.) Tamamsch.

+ Plants densely pubescent, but without golden glands; stem solitary..11

11. Plants 10–12 cm high, gray due to horizontally divergent 2–3 mm long hairs; lower leaves two or three, persistent during flowering, oblong-spatulate, middle leaves dense, sessile, lanceolate..10. **H. noneifolius** Tamamsch.

+ Plants 40–50 cm high; middle cauline leaves linearly lanceolate, acuminate; pappus chestnut- or brown-colored, sometimes grayish..11. **H. tataricus** (Lindl.) Tamamsch.

66 *Section* 1. PSEUDOCALIMERIS Tamamsch.—Perennial plants with several stems; involucral bracts dorsally herbaceous, along margin dry white-membranous; pappus similar in all achenes.

Series 1. Perennes Tamamsch.—Perennial plants with several shoots and different pubescence.

1. **H. distortus** (Turcz.) Tamamsch. comb. nov.—*Aster distortus* Turcz. ex Avée-Lall. in Ind. Sem. Hort. Petr. VIII (1841) 53; Turcz. Fl. baic.-dah. II, 18. —*A. pumilus* Fisch. in Cat. H. Gorenk. (1808) 62 nom. nud. —*A. altaicus* var. *distortus* (Turcz.) Poplav. in Tr. Bot. Muz. Akad. Nauk, XV (1916) 54; Serg. in Fl. Zap. Sib. XI, 2664.— **Ic.**: Poplavskaya, op. cit. Fig. 4.

Perennial. Stems numerous, spreadingly branched and short, ascending from very base or almost prostrate, 4–10 cm high, densely leafy, leaves 1–3 mm wide, densely hairy. Capitula solitary or in pairs, on short peduncles, about 2.0–2.5 cm wide; involucral bracts 1 mm wide with very narrow membranous margin, dorsally hairy; ligules pinkish, somewhat longer than width of disk; achenes 1–2 mm long, with similar pappus; pappus chestnut-colored, of almost identical setaceous hairs. Flowering VII–VIII. (Plate V, Fig. 2).

Dry steppes. —*Eastern Siberia*: Dauria. *General distribution*: Northern Mongolia. Described from the Uda steppe. Type in Leningrad.

2. **H. altaicus** (Willd.) Novopokr. in Sched. ad Herb. Fl. ross. VIII (1922) 193. —*A. altaicus* Willd. Enum. Hort. Berol. (1809) 880; Ldb. Fl. Alt. IV, 99; Winkler in Tr. Peterb. Bot. Sada, XIV, 123; Kom. Fl. Manchzh. III, 605; Kitamura, Comp. Jap. I (1937) 367; Krylov, Fl. Zap. Sib. XI, 2664. —*A. gmelini* Tausch, in Flora (1839) 78, non Tausch, 1828, non Ldb. 1841.—*Calmeris* [sic.; *Calimeris*] *altaica* Nees, Gen. et sp. Aster. (1832) 228; DC. Prodr. V (1836), 258; Ldb. Fl. Ross. II, 482; O. and B. Fedtsch. Perech. Rast. Turk. 4, 161 p. p. —*C. exilis* DC. 1. c. —**Exs.**: GRF No. 2769.

Perennial. Stems usually many, branches spreading almost always from base, with short branches in leaf axils, erect or ascending, 30–60 cm high, covered with thin upward directed hairs. Leaves 3–7 cm long, 4–7 mm wide, sessile, linear or linearly oblong, gradually narrowed toward base, obtuse or somewhat acute, pubescent with flexuous thin hairs on both surfaces and with numerous very fine shining glands; uppermost leaves gradually decreasing in size. Capitula numerous, together with ligules up to 3.5 cm wide, in corymbose paniculate inflorescences; involucral bracts three-rowed, finely hairy with rough hairs and sparsely glandular, outermost bracts linear and shorter than those of inner row. Ligulate florets pale blue or lilac, 2.0–2.5 mm wide. Achenes 67 2–3 mm long, oblong-obovate, hairy; pappus whitish or pale brown, longer than achene, consisting of almost equal setaceous hairs in all achenes. Flowering VII–VIII.

Steppe, saline meadows, and rubbled, stony slopes of low mountains.—*Western Siberia*: Upper Tobol, Irtysh, Altai; *Eastern Siberia*: Angara-Sayans, Lena-Kolyma (south); *Soviet Central Asia*: Balkhash Region (north). *General distribution*: Mongolia. Described from the Altai. Type in Berlin.

3. **H. alberti** (Rgl.) Novopokr. and Tamamsch. h. 1. —*Calimeris alberti* Rgl. in Tr. Peterb. Bot. Sada, VIII (1884) 641; O. and B. Fedtsch. Perech. Rast. Turk. 4, 161.—**Ic.**: Gartenfl. 33 (1884) 30.

Perennial. Plants green, covered with scabrous hairs on ridges; stems ascending, branching in upper part like candelabrum, with secondary branches. Leaves not compactly and uniformly arranged, narrowly linear, acuminate, up to 3 cm long; lower leaves shedding early; leaves on peduncles 0.5–1.0 cm long, 1–2 mm wide; peduncles slender, sometimes horizontally divergent, somewhat ridged, more or less angular, with isolated white hairs. Capitula solitary, 2.0–2.5 cm wide; involucral bracts four-rowed, linearly subulate, attenuate into loosely imbricate and green, awnlike structures, outer ones without membranous margin, somewhat pubescent. Ligules linear, bluish-purple, 13 mm long, two times as long as disk florets; receptacle somewhat convex, alveolate.

Achenes oblong, dorsally compressed, somewhat pubescent; pappus in all achenes identical, almost as long as involucral bracts. Flowering VIII.

Dry steppes, sometimes in tea thickets. —*Soviet Central Asia*: Kyzyl-Kum, Kara-Kum, Balkhash, Tien Shan. Described on the basis of specimens raised from seeds obtained from Bukhara. *General distribution:* China. Type lost?

4. **H. canescens** (Nees) Novopokr. in Sched. ad Herb. Fl. ross. VIII (1922) 193. —*Calimeris canescens* Nees, Gener. et sp. Aster. (1832) 223; DC. Prodr. V, 259 p. p. —*Aster altaicus* var. *canescens* (Nees) Serg. in Krylov, Fl. Zap. Sib. XI (1949) 226. —*A. lithospermifolius* DC. l. c.

Perennial. Rhizome vertical, rather thick, with several shoots and adventitious roots; stems grayish green because of dense short, more or less persistent, ascending hairs, branched, particularly in upper part. Lowermost leaves indistinctly toothed, usually falling before flowering; middle and upper leaves entire, oblong-lanceolate or linear, those on branches much smaller and narrower, with inconspicuous punctiform glands, gray-pubescent like stem; middle leaves 6–7 cm long, 15 mm wide, obtuse, or short-acuminate. Capitula 2–3 cm wide, on long, often decumbent peduncles, in loose corymbose inflorescence, one to three on peduncles covered with small, linear, apical leaves. Involucral bracts pubescent, oblong-linear, sometimes almost subulate, narrowed downward, 68 more or less long-acuminate upward; outer ones herbaceous, inner ones with whitish membranous margin. Ligulate florets 14–15(16), ligules about 12 mm long, 2.5 mm wide, blue; tubular disk florets two times as long. Achenes compressed, along edge slightly thickened, sometimes with narrow whitish fringe, much larger in disk florets than in peripheral florets. Pappus almost identical in all achenes, usually consisting of smoky and yellowish, slightly setaceous, hairs, 3.5–4.5 mm long. Flowering V–IX.

Dry grassy steppe slopes with rubbly and stony soil in mountains and foothills. *Caucasus*: Eastern Transcaucasia, Dagestan (as an introduction); *Western Siberia*: Altai (southern part); *Soviet Central Asia*: All regions. *General distribution:* Iran region (Afghanistan). Described from Aralo-Caspian (Saga) region. Type in Sweden?

Note. A highly polymorphic species; varies in size of leaves, particularly on peduncles, and in branching.

Section 2. PSEUDOASTER Tamamsch. —Biennial plants; stems usually solitary, less often two or three. Involucral bracts herbaceous; pappus either identical in all achenes or different in peripheral and disk florets.

Series 1. Medii Tamamsch. —Stems several; with fine golden glands besides whitish hairs on leaves and particularly on involucral bracts and below capitula.

5. **H. medius** (Kryl.) Tamamsch. comb. nova. —*H. altaicus* var. *hirsutus* Novopokr. in Sch. Herb. Univ. Tomsk. —*Aster altaicus* β. *medius* Kryl. in Fl. Alt. (1904) 588. —*A. medius* Serg. in Sist. Zap. po Mat. Gerb. im. Krylova (1944) No. 2 and in Krylov, Fl. Zap. Sib. XI (1949) 2665. —*A. medius* var. *euphorbiifolius* Serg. op. cit. (1949) 2566.

Biennial. Stem 30–60 cm high, weakly branched, only in uppermost part, sometimes slightly purple-colored, covered with isolated short or much longer simple hairs and short glandular hairs. Leaves green, oblong-linear or linear, obtuse, 3–6 cm long, 2–8 mm wide, covered with appressed hairs on both sides, with or without occasional, not prominent glands. Capitula numerous, 3–5 cm wide, in corymbose or short paniculate inflorescence. Involucral bracts ovately lanceolate or lanceolate, acuminate, along margin membranous and fimbriate, sometimes colored, densely and finely pubescent with golden glandular hairs; peduncles below capitulum densely covered with glandular hairs. Ligulate florets dark blue or bluish-lilac; corolla tubes ciliate; tubular florets glandular on outer side of limb. Pappus in all achenes identical. Achenes oblong-obovate, hairy. Flowering VII.

Steppe meadows, stony and rubbly slopes. —*Western Siberia*: Altai; *Eastern Siberia*: Angara-Sayans, endemic. Described from the Altai. Type in Tomsk; isotype in Leningrad.

69 *Note*. The species occupies an intermediate position between *H. canescens* (Nees) Novopokr., on the one hand, and *H. altaicus* (Willd.) Novopokr. and *H. tataricus* (Lindl.) Novopokr., on the other hand,

Series 2. Hispidi Tamamsch. —Pappus different—in peripheral achenes absent or consisting of fewer short hairs; in achenes of disk florets gradually becoming longer toward center.

6. **H. pinetorum** Kom. in Izv. Bot. Sada Akad. Nauk SSSR, XXX (1931) 216.

Biennial. Rhizome thin, horizontal, with stolons; sterile shoots branched, short, covered with leaves; lower leaves long-petiolate, oblanceolately oblong, coarsely and irregularly toothed, gradually narrowed into petiole, up to 15 cm long, 2 cm wide; flowering shoots 20–40 cm high, covered with linear or lanceolate leaves with single vein, along with stem slightly pubescent. Capitula flowering at different times, in compound corymb; peduncles as well as stem densely pubescent;

involucral bracts three-rowed, narrowly linear, long-acuminate, 5–7 mm long, covered dorsally with stiff hairs, along margin slightly ciliate. Ligules of peripheral florets 10–12 mm long, narrow, blue or white, tube 2 mm long, whitish with cilia. Achenes densely pubescent, with short whitish pappus; pappus as long as corolla in achenes of disk florets. Flowering IX.

Pine forests on gravelly soil. —*Far East*: Ussuri. Endemic. Described from Sosnovaya Pad near Nikolsk. Type in Leningrad.

7. **H. hispidus** (Thunb.) Less. Syn. Comp. (1832) 189; DC. Prodr. V, 287; Maxim. Prim. Fl. Amur. 146; Kom. Fl. Manchzh. III, 585, p. p.; Matsum. Ind. Pl. Jap. II, 651; Kitamura, Comp. Jap. (1937) 318. —*H. hispidus* var. *heterochaeta* Franch. Fl. Jap. II (1856) 596. —*H. hispidus* var. *disciflorus* Kom. Fl. Manchzh. III (1907) 587. —*H. hispidus* var. *tubulosus* Kitamura (1. c.). —*H. incisus* Sieb. and Zucc. Fl. Jap. fam. nat. (1846) 182. —*H. decipiens* Maxim. Prim. Fl. Amur. (1859) 148. —*Aster hispidus* Thunb. Fl. Jap. (1784) 315; Makino in Tokyo Bot. Mag. XII, 305; Nakai, Fl. Kor. II, 9. —*Aster altaicus* var. *tubulosus* Kitamura, Comp. nov. Jap. (1931) 19.—*Calimeris hispida* Nees, Gen. et Sp. Aster. (1833) 227.

Annual or biennial. Root slender, partly fibrous. Stem erect, 30–100 cm high, finely sulcate, densely leafy. Basal leaves shedding early, oblanceolate, obtuse, at base abruptly narrowed into winged petiole, sparsely toothed, ciliate, ventrally dark green, dorsally much lighter; middle leaves oblanceolate or linear, 5–7 cm long, 0.5–2.0 cm wide; obtuse, at base narrowed, leaf margin entire or less often serrate, somewhat revolute, with bent or stiff hairs; upper leaves gradually reducing. 70 Capitula on long peduncles, covered by bracteal leaves; peduncles covered with dense curly hairs, in broad corymbs. Involucral bracts two-rowed, almost identical, herbaceous, linearly lanceolate or inner ones rhomboidal-lanceolate, dorsally pubescent, acuminate. Receptacle slightly conical; disk florets 5–7 mm long; styles attenuate at tip. Ligulate florets white. Achenes dorsally compressed, 2.5–3.0 mm long; pubescent with appressed stiff hairs; pappus of peripheral florets white, 0.5 mm long; irregularly coronate and setaceous in the disk florets, bristles gradually becoming longer from outer to inner florets, dark gray or reddish, 3.5–4.0 mm long, attenuate above. Flowering VI–X (Plate V, Fig. 1).

Stony and sandy bluffs, gravel-beds.—*Far East*: Zeya-Bureya, Uda River area, Ussuri. *General distribution*: Japan, China, Korea, Mongolia. Described from Japan. Type in Stockholm; isotype in Leningrad.

Series 3. Subglabri Tamamsch.—Pappus developed in all achenes, identical.

8. **H. saxomarinus** Kom. in Izv. Bot. Sada, XXX (1931) 217; Kom. and Alis. Opredel. Rast. Dalnevost. Kraya, II (1932) 1009.

Biennial. Rhizome without stolons; lower leaves shedding early. Stem simple in lower part, up to 20 cm, branching above, 6 mm thick, cylindrical, glabrous or subglabrous; branched part up to 10 cm long. Leaves sessile, oblong, 12 mm long, acuminate and thick, shining, with indistinct veins, glabrous or coarsely ciliate along margin and on veins. Terminal capitula on densely leafy peduncles; involucral bracts glabrous or less often sparsely hispid, or sometimes ciliate, linearly lanceolate, with awnlike projection up to 7 mm long, 1.5 mm wide. Ligulate florets pinkish-lilac or bluish. Achenes hairy; pappus of setaceous, brightly colored bristles of identical length in peripheral and disk florets. Flowering VIII–IX.

Crevices of coastal rocks.—*Far East*: Ussuri (extreme south). Described from islands of Peter-the-Great Bay. Endemic. Type in Leningrad.

9. **H. elisabethinus** Tamamsch. in Addenda XXIV, 578.

Biennial. Plants almost glabrous. Stem 25–30 cm high, thick, solitary, about 1 cm thick, pedunculate from base, glabrous or occasionally somewhat pubescent, more or less angular and densely leafy. Lower leaves 9–10 cm long and 16–17 mm wide, oblong-lanceolate, strongly narrowed toward base, somewhat amplexicaul, three-veined, lamina entire, along veins and margin slightly pubescent with thin hairs; middle 71 and upper leaves similar to lower ones, but somewhat reduced in size, sometimes weakly sinuate, all leaves somewhat thickened. Capitula pedunculate, solitary, about 5 cm thick; involucral bracts herbaceous, very narrow and long, outer ones linearly lanceolate, 0.7–0.8 cm long, green, almost glabrous; inner bracts colored, slightly pubescent with very long, almost subulately attenuate tip, often revolute, two times as long as outer ones, half or more as long as ligule; ligules bluish-lilac, 2.5 cm long; receptacle alveolate, pits uniformly and scaly-toothed on edges. Achenes narrow, obovoid, pubescent with appressed hairs; pappus in all achenes identical, of almost identical setaceous reddish-brown hairs, shorter than or almost as long as achenes, half as long as tubular disk florets or considerably shorter than ligulate florets. Flowering VIII–IX.

Coastal cliffs. —*Far East*: Sakhalin, Uda River area (north). Endemic. Described from Schmidt Island and Elizabeth Cape. Type in Leningrad.

10. **H. noneifolius** Tamamsch. in Addenda XXIV, 578.

Biennial. Plants 15–18 cm high. Stem solitary, branched from base, slender, covered with dense, white, horizontally divergent, long hairs, densely leafy. Lower leaves two or three, oblong-elliptical, on winged petiole, at base expanded and slightly amplexicaul; together with petiole about 6 cm long, 1 cm wide; lamina in lower half obtusely crenate, with two or three teeth on each side, with three prominent veins on dorsal side, densely pubescent with distant long hairs along veins and also with dark spots (bases of shedded hairs); middle leaves narrowly lanceolate, single-veined, entire, scabrous due to stiff and appressed hairs on blade and erect hairs on margin, 3.0–3.5 cm long, 0.5 cm wide. Capitula solitary at tips of peduncles; involucral bracts narrow, white because of dense pubescence, acuminate, below near base somewhat ribbed, hairs along midrib and particularly along margin long, 1.0–1.5 mm long, almost as long as bracts; inner bracts at base with narrow whitish margin. Ligulate florets almost 1.2–1.5 cm long, 2 mm wide, pinkish-lilac. Achenes obovoid, pubescent with appressed hairs; pappus in all achenes identical, of reddish-brown setaceous hairs, tapering above, equal to or slightly longer than achenes. Flowering IX.

Coastal marine deposits with dense herbaceous thickets. *Far East*: Ussuri (eastern part). Endemic. Described from the Terkei Region, from Malaya Inlet. Type in Vladivostok.

11. **H. tataricus** (Lindl.) Tamamsch. comb. nova.—*H. sibiricus* Kom. Fl. Manchzh. III (1907) 587; Kom. and Alis. Opredel. Rast. Dalnevost. Kr. II (1932) 1010.—*Aster biennis* Ldb. Ind. Sem. Horti. 72 Dorp. Suppl. 1 (1811) nom. nud.; Ldb. Fl. alt. IV, 97, in nota; Krylov, Fl. Zap. Sib. XI, 2666 p. p.—*Calimeris biennis* Ldb. Fl. Ross. II (1844–1846) 483, non Nees (1832). —*C. tatarica* Lindl. apud DC. Prodr. V (1836) 259. —*Callistephus biennis* Lindl. in DC. ibid. 274.

Biennial. Stem 20–40 cm high, usually solitary (occasionally two or three), purple or reddish, particularly in lower part branched, covered with simple many-celled, erect and divergent hairs and also with glandular hairs. Lower leaves shedding, but persisting in upper half, linear, acuminate, 2–6 cm long, 2–5 mm wide, appressed hairy, with or without sparse indistinct glands. Peduncles sparsely pubescent, rather densely leafy; bracteal leaves linear, narrowly acuminate, similar to outer involucral bracts and often indistinclty distinguishable from them. Outer involucral bracts narrowly linear; inner ones lanceolate, in lower half with distinct or sometimes not so distinct glands, lanceolately acuminate. Capitula in loose corymb, axes of corymb bearing two to six large capitula at tips; capitulum together with ligulate florets 3–5 cm wide; liguate florets filiform, dark blue or bluish-lilac, 14–20 mm long. Achenes obovoid, hairy; pappus chestnut-brown or whitish, identical in all achenes or almost identical. Flowering VII–VIII.

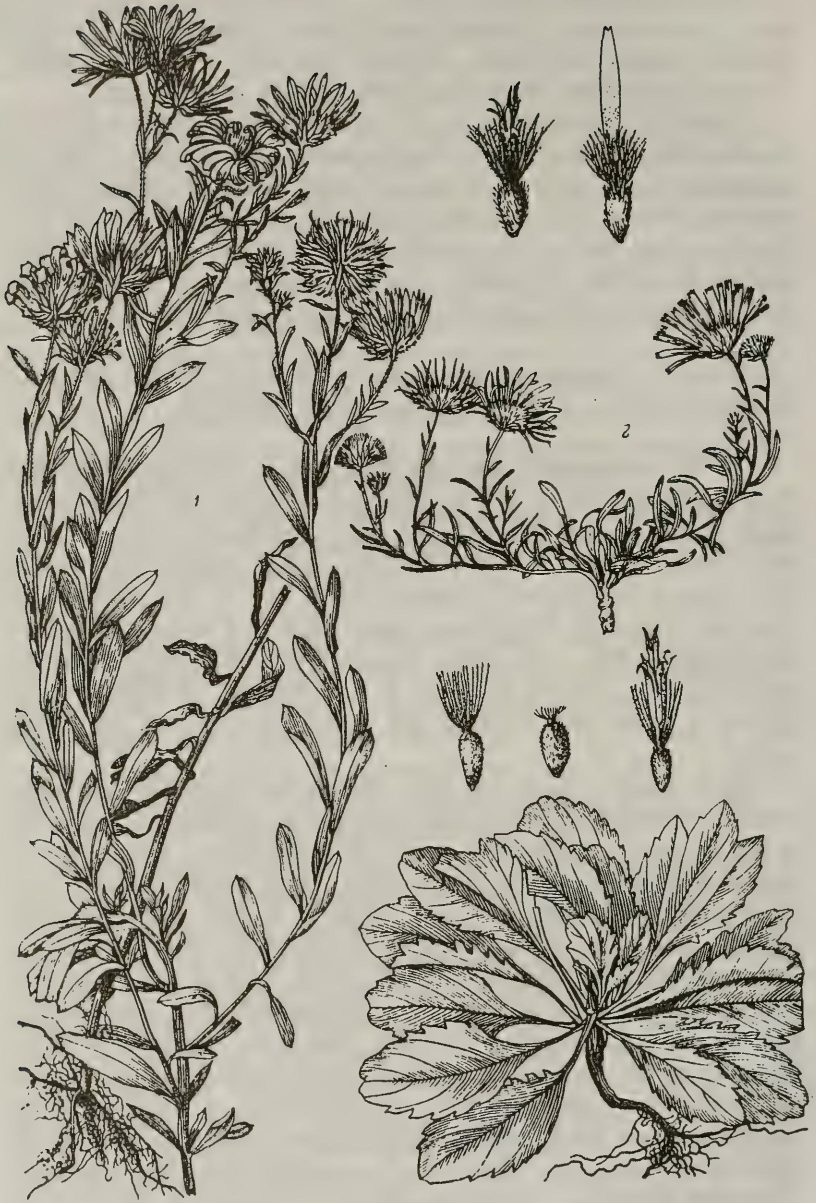
Steppe meadows and old fields. —*Western Siberia*: Altai (eastern part); *Eastern Siberia*: Angara-Sayans, Dauria, Lena-Kolyma; *Far East*: Uda River area, Zeya-Bureya, Okhotsk. Described from Eastern Siberia. *General distribution*: Mongolia, China. Isotype in Leningrad.

Notes. L.P. Sergievskaja in *Fl. Zap. Sibiri* names this species *Aster biennis* Ldb., and identifies it with *Calimeris tatarica* Lindl. In the new combination, this species should have been named *H. biennis* (Ldb.); however, because of the fact that it remained uncertain whether, in 1811, Ledebour described or only named this species, we are giving preference to the epithet of Lindley (*tatarica*), because it is the prior name for this species, which was described by De Candolle.

Series 4. Depauperati Tamamsch. —Achenes of ligulate florets undeveloped. Pappus often absent, sometimes developed.

12. **H. meyendorfii** (Rgl. and Maack) Kom. and Alis. in Opredel. Rast. Dalnevost. Kr. II (1932) 1010.—*H. hispidus* var. *longeradiatus* Kom. in Fl. Manchzh. I (1907) 587, p. p. —*Galatella meyendorfii* Rgl. and Maack, Tent. Fl. Ussuri (1861) 81. —*Aster meyendorfii* Voss. in Vilm. Blumg. I (1894) 469; Kitamura, Comp. Jap. 55. —*A. depauperatus* Lev. and Vaniot in Bull. Acad. Geogr. Bot. XX Mém. (1909) 142, non Fernald (1908). —*A. altaicus* Nakai, Fl. Sylv. Kor. XIV (1923) 103, non Willd. —*A. ciliosus* Kitamura in Acta Phytotax. et Geob. I (1934) 98 and in Comp. Jap. I (1937) 365. —**Ic.**: Regel, op. cit. tab. V, fig. 2–6.

73 Stem straight, 35–50 cm high, slightly sulcate throughout length, usually branched from middle, branches straight, spreading. Lower leaves shedding early, long-petiolate, ovate or ovate-oblong, obtuse, at base cuneately narrowed into petiole, crenate, along margin sparsely hairy, three-veined; middle cauline leaves linear or linearly lanceolate, dense, 6–8 cm long, 1–2 cm wide, obtuse, narrowed downward, sessile, in upper part coarsely toothed, with or without awnlike projection, their laminas ventrally green and sparsely hairy with stiff hairs, much brighter dorsally and less pubescent, flat, with single vein; upper leaves gradually reducing in size, up to 3 mm long. Capitula numerous, on long and short peduncles, with small leaves at base similar to involucral bracts; involucral bracts herbaceous, linear, acuminate, as long as or exceeding disk, dorsally pubescent, inner bracts somewhat broader than outer ones, sometimes whitish on lower side along margin. Ligulate florets 21–55 mm long, less often 30 [sic.] mm long, their tubular part pubescent; ligules more than two times as long as involucral bracts, bright blue, tip entire or with two teeth; disk florets with tube pubescent on outer side. Achenes fully developed only in disk florets, oblong-obovoid, with



75 Plate V.

1—*Heteropappus hispidus* (Thunb.) Less., habit, and basal rosette, achene from center of capitulum (left), peripheral achene (right), achenes with pappus and disk florets; 2—*H. distortus* (Fisch.) Tamamsch., habit, achenes of tubular and ligulate florets.

dense silky pubescence; pappus dark brown, many-rowed, with setaceous hairs, as long as corolla tube of disk florets; achenes in ligulate florets always undeveloped, but pappus absent or consisting of small number of setaceous hairs. Flowering VIII–IX.

Sandy soils and dry slopes. —*Far East*: Ussuri (south). *General distribution*: Japan, Korea. Described from Khanka. Type in Leningrad.

Note. Regel referred this species to the genus *Galatella*, because he found sterile ligulate florets in the capitula, but in comparing it with *G. hauptii*, he mentioned that this species differs sharply from the genus *Galatella* in the shape of the involucre and its bracts. The general appearance of the structure of the pappus, involucre, and achene indicates that this species belongs to the genus *Heteropappus*. The achenes of the ligulate florets are always rudimentary, but sterile ligulate florets, similar to those of the genus *Galatella*, are found only as an exception.

Economic Importance. The plants are highly ornamental, thanks to large and numerous flowers.

GENUS ***Callistephus** Cass. [1], [2]

Cass. in Dict. Sc. Nat. XXXVII (1825) 464, 469; Benth. and Hook. Gen. pl. II, 270. —*Callistemma* Cass. op. cit. VI. Suppl. (1817) 45, non R. Br. 1810

Capitula large, with many florets, borne singly at tip of stem and its branches. Involucre hemispherical, many-rowed, consisting of
74 imbricately arranged bracts; outer bracts unequal, leafy, green, spatulate, long-ciliate along margin; inner ones much shorter, one- or two-rowed, membranous, pale, slightly lobed, obtuse, glabrous. Receptacle flat or slightly convex, alveolate, alveolae with a short entire fringe. All florets fertile; peripheral florets pistillate, long-ligulate, several times as large as discal florets, one- or two-whorled (many-whorled in double-corolla forms, as a result of modification of tubular florets into ligulate ones), ligules entire or shortly two-toothed at tip, variously colored; central florets bisexual, in several whorls, yellow, tubular, with expanded limb, at tip shallow five-fid; anthers at base obtuse, undivided; style branches flat, externally and along edges very finely woolly. Achenes obcuneate-ovoid, somewhat compressed, slightly hairy; pappus of achenes two-rowed, consisting of outer row of very short setaceous hairs fused at base into ring and inner row of long plumose hairs.

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[1] Treatment by V.F. Golubkova.

[2] From the Greek words *kallos*—beautiful, and *stephos*—corolla (in reference to the ornamental value of the plant).

Annual herbs with few branches and alternate sessile coarsely toothed leaves.

Monotypic genus from China and Japan.

1. **C. chinensis** (L.) Nees, Gen. et sp. Aster. (1833) 222. —*C. hortensis* Cass. in Dict. Sc. Nat. XXXVII (1825) 491. —*Aster chinensis* L. Sp. pl. (1753) 877. —*Callistemma hortense* Cass. op. cit. VI. Suppl. (1817) 45; and Bull. Soc. Philom. (1817) 32, non R. Br. —*Diplopappus chinensis* Less. Syn. Gen. Comp. (1832) 165. —**Ic.**: Hegi, Ill. Fl. VI, 1, 450, fig. 227, a, b.

Annual. Stem hard, up to 1 m high, erect, solitary, simple or sparsely branched, with inclined branches, longitudinally sulcate, covered with isolated slightly bent hairs, sometimes reddish. Lower leaves much larger, lamina of leaf 3–7 cm long, 3–5 cm wide, ovate-rhomboidal, subacute, both margins unevenly coarsely toothed-serrate, at base narrowed into 3–7 cm long petiole, as long as lamina; middle leaves somewhat smaller, oblong, subobtuse, with fewer teeth, at base cuneately narrowed into winged petiole much shorter in leaves toward apex; uppermost leaves 3–8 cm long and 0.5–1.3 cm wide, sessile, entire, spatulately lanceolate-oblong, obtuse or subobtuse; all leaves ciliate along margin and petiole and on dorsal surface along midrib. Capitula 2–10 cm wide; involucre 1.5–9.0 cm wide, outer bracts 0.8–3.0 cm long and 0.5–0.8 cm wide, inner bracts 0.7–1.3 cm long and 0.3–0.6 cm wide. Ligulate florets long, corolla 3.5–5.5 cm long, blue, purple, violet, 77 lilac, pink or white, uniformly colored or with longitudinal white stripes, ligules 5–7 mm wide; style branches scarcely exserted from corolla tube; tubular florets numerous, very small, corolla somewhat longer than pappus, 4–7 mm long, with limb many times as long as short tube, stigma inserted or its branches slightly exserted from corolla; corolla of all florets glabrous. Mature achenes grayish, 4–5 mm long, short hairy; pappus white, about 5 mm long. Flowering VII–X.

A beautiful ornamental flowering plant cultivated in gardens. Native to China and Japan. Described from China. Type in Berlin.

GENUS 1462. **Aster** L. [1, 2]

L. Sp. pl. (1753) 872; Nees, Gen. et Sp. Ast. (1832) 16; DC. Prodr. V (1836) 226; Torrey and Gray, Fl. N. Am. II (1841) 103 p. p.; Benth. and Hook. f. Gen. pl. II (1873) 271, p. p.; Baillon, Hist. d. pl. VIII (1882) 135, p. p.; Hoffm. in Pflanzenfam. IV, 5 (1894) 161 p. min. p

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[1] Treatment by S.G. Tamamschjan.

[2] From the Greek word *Aster*—star (named for starlike shape of capitula).

Capitula of different sizes: large (8–15 cm wide) to medium and small (1.0–1.5 cm wide), solitary or in panicles, or in simple of compound corymbs, heterogamous, heterochromous, and heterostylous, ligulate. Ligulate florets in one or one-and-one-half whorls, very rarely in two whorls. Involucre infundibuliform or hemispherical; involucral bracts two- or three-rowed, sometimes indistinctly four-rowed, usually imbricate, usually outer bracts shorter than inner ones, less often almost identical, entirely herbaceous or herbaceous dorsally and apically, apex sometimes enlarged into somewhat spatulate appendage, or dry, along margin dry-membranous and sometimes colored at tip. Receptacle flat or somewhat convex, alveolate, alveolae membranous, undivided or notched. Disk florets bisexual, fertile; corolla yellow, tubular, from base gradually expanding into five-toothed, usually symmetric limbs. Peripheral florets pistillate, also fertile; corolla tube narrow, very short, cylindrical, sometimes sparsely glandular or hairy, terminating into very long, usually three-toothed, sometimes two-toothed ligule. Ligules white, whitish-pink, purple, blue, or violet. Anthers more or less linear, obtuse at base, undivided, round, with lanceolate apical appendage; filaments of stamens straight, glabrous, round in transverse section. Style branches more or less flat; appendages in pistillate florets much narrower, acuminate or obtusely triangularly lanceolate, in bisexual florets much broader, sometimes deltoid, externally glandular and with fine hairs. 78 Achenes somewhat compressed dorsally, obovoid, usually densely pubescent with upward directed appressed hairs, less often achenes slightly pubescent or glabrous, with single vein along edges, ventrally sometimes only with single vein, but often without it. Pappus long, usually three to four times as long as achene, but considerably shorter than ligules, consisting of several setaceous hairs arranged in one or two rows, of equal or almost equal length and slightly narrowed at tip.

Perennial herbs with straight, branching or more often unbranched stem, sometimes acaulescent and with only one or few floral scapes (section *Alpinaster*); with alternate, very large or quite small leaves, with margin entire or toothed, sometimes more or less crenate or wavy.

Of the numerous species of this genus distributed mainly in North America and to a lesser extent in South America and Africa, we have 26.

Note. Aster is the largest genus in the tribe Astereae. The total number of species included in this genus varies. In one of the first monographs, Nees von Esenbeck (1833) treats 103 species; according to Hoffmann (1894), the genus contains 200 species. Small (1913) and Burges and Alexander (1933) account for 250 species. This very number is mentioned by Cronquist (1933) also; however, Philipps (1950) raises the number to 1,000. Core (1955), the latest among the authors, referred only 600 species to the genus. These contradictions are partly explained by differing interpretations of the limits of the genus within the composites.

At present there still is no monograph of this genus, and the investigations of it pertain only to individual groups; for example, the studies of Burges (1900, 1906) concern only section *Biotia*, and the treatment of Onno (1932) pertains to section *Alpigenia*. Treatments of the genus in regional floras and in individual articles, which are devoted to other of its groups (Cronquist, Rydberg, Kemularia-Nathadze), do not give complete picture of the genus *Aster* as a whole.

Nees' monograph has become outdated. So are the reviews of this genus by De Candolle and Bentham and Hooker.

Hoffmann's (1897) interpretation of the genus *Aster* was too broad. The sections established by Hoffmann without doubt represent a number of separate genera. For example, in the section *Orthomeris* Hoffmann includes species that belong to other genera recognized by almost all synantherologists. These are monotypic genera such as *Doellingeria*, *Arctogeron*, as well as *Turzaninovia*, *Heleastrum*, and *Biegelovia* [sic.; *Bigelowia*], *Kalimeris*, and *Callistephus*. The genus *Galatella*, which differs sharply from *Aster* by having few sterile ligulate florets and by the structure of the involucre, and also the genus *Linosyris*, which differs from both *Aster* and *Galatella* by having homogamous and homochromous capitula, were included totally arbitrarily by Hoffmann in *Aster*. It must be said that the Astereae divide into two quite natural
79 groups — Homochromeae and Heterochromeae. If we interpret *Aster* in the spirit of Hoffmann, then there are both homochromous and heterochromous species in the genus. However, homochromy is generally correlated with other characters as well, such as reduction of the ligules in the peripheral florets (genera *Linosyris*, *Pseudolinosyris*, *Conyzantos*, *Asterioconyton*), variation in the length of the style branches (stylodia) and in the shape of their appendages, and clear affinity of these genera to other tribes of the family Compositae. In their time, Cassini, De Candolle, and Lessing paid attention to these characters. The nature of the receptacle, involucral bracts, and form of the achene, as well as the form and size of the pappus and its presence or absence, are also linked with these characters.

The genus *Aster* is quite artificial in the interpretation of North American authors. Burges (1901–1906) had already written that section *Biotia* should be treated as a separate genus (as was done by De Candolle) or at least as a subgenus. Cronquist (1953, 1956) recognized that the genus *Aster*, in his opinion, consisted of species of different origin with highly diverse characters. Cabrera, who is working on the South American composites, considers it possible to establish new genera on the basis of only one character, for example, a change in the form of the pappus.

On the basis of external morphological characters the Eurasian and American species are clearly divided into two separate groups. Annen (1945) and a number of Japanese authors, who have studied the karyosystematics of *Aster*, hypothesized that these two groups are not genetically related and that it is quite probable that the Eurasian and American species do not have a common origin and, moreover, that the former (Eurasian ones) have a haploid (base) chromosome number of 9, but the latter (American ones), of 5.

A. amellus L., described from North America, is the type of the genus *Aster*.

Economic Importance. Many species of *Aster* have long been cultivated in gardens and parks. Almost all representatives of the wild asters of the flora of the USSR are quite ornamental, and they can be the source for the development of new varieties. Some of them, e.g., *A. alpinus* L., *A. amellus* L., and *A. tataricus* L. f., have been introduced, and they supplement the assortment of earlier known cultivated asters.

1. Stems usually tall (up to 100 cm high), very woody. Pappus many-rowed; achenes glabrous or subglabrous; if achenes pubescent, then involucral bracts with glandular hairs....................2

+ Stems less often up to 100 cm high, usually 5–60 cm high and never woody. Pappus one- or two-rowed; achenes usually densely pubescent; involucral bracts without glands.................................6

2. Capitula rather large, 3–5 cm, under cultivation 8–15 cm wide. Involucral bracts pubescent with simple or glandular hairs...........3

+ Capitula much smaller, 1–3(3.5) cm wide. Involucral bracts glabrous, dry, sometimes herbaceous only at tip or on back..........4

80 3. Capitula about 3 cm wide, with 15–20 ligulate florets in capitulum; involucral bracts pubescent, but without glands, outer ones sometimes recurved.....................................1. **A. novi-belgii** L.

+ Capitula very large, 5(8–15) cm wide with ligules, with 45–100 ligulate florets in capitulum; involucral bracts pubescent with sticky glandular hairs..............................5. **A. novae-angliae** L.

4. Capitula very small (1 cm wide). Involucral bracts dry, stiff; ligules very narrow (1.0–1.5 mm wide).. ....2. **A. parviceps** (Burg.) Mack.

+ Capitula medium, sometimes even large, 3–5(7) cm wide; involucral bracts more or less herbaceous, usually three- or four-rowed; ligules more than 1.5 mm wide.......................................5

5. Lower leaves with winged petiole; upper leaves sessile, with cordate base, entire or small-toothed....................3. **A. laevis** L.

+ Lower leaves with attenuate base, but sessile. All leaves lanceolate with long attenuate tip, scabrous along margin or sharply toothed along entire margin or only from middle upwards; uppermost leaves much smaller, entire, amplexicaul...4. **A. salignus** Willd.

6. Involucral bracts narrow, linearly lanceolate, herbaceous, two-rowed; outer and inner bracts almost identical. Plants with rosette of basal leaves; capitulum usually solitary on leafless or sometimes somewhat leafy peduncle..22

+ Involucral bracts variously shaped, three- or four-rowed, imbricate, unequal, usually with greenish or colored appendage at tip. Plants with one or many leafy shoots..7

7. Capitula small, 1–3 cm wide; involucre infundibuliform, bracts with dark (greenish or purple) colored upper whorl, and scarious margin. Pappus shorter than corolla of disk florets......................17

+ Capitula large (5–7 cm wide); involucre hemispherical, bracts herbaceous; pappus as long as or somewhat longer than corolla of disk florets..8

8. Involucral bracts usually produced upward into obtuse or somewhat acuminate appendage; corolla of ligulate florets bluish or slightly violet-blue. Leaves entire, three-veined form base........9

+ Involucral bracts without appendage, lanceolate and acuminate. Leaves usually toothed..11

9. Plants glabrous or somewhat pubescent. Outer involucral bracts almost glabrous, obtuse, recurved; inner ones lanceolate; both types colored. Lower leaves elliptical and spatulate. Stem often reddish..6. **A. amellus** L.

81 + Plants more densely pubescent, scabrous. Outer involucral bracts subacute, more or less pubescent...10

10. Plants green, somewhat pubescent. Capitula numerous, 16–20 mm wide. Involucral bracts stiff, on dorsally densely pubescent ....7. **A. amelloides** Bess.

+ Plants grayish-green due to dense pubescence. Capitula less numerous, but large, 3–5 cm wide. Involucral bracts more densely setose on outer side, usually not colored, acutish...8. **A. ibericus** Stev.

11. Achenes hairy or densely glandular. Involucre hemispherical, bracts linearly lanceolate, edges of alveolae of receptacle toothed ....9. **A. glehnii** Fr. Schmidt.

+ Achenes densely pubescent, sometimes with isolated glands. Involucre hemispherical, bracts oblong; membranous edges of alveolae of receptacle undivided..12

12. Plants 1.0–1.5 m high (less often 2.0 m). Capitula in compound corymbs..13

+ Plants comparatively smaller, never 1 m high. Capitula solitary or in small clusters or in simple corymbs....................................14

13. Capitula in compound corymbs, 2.5–3.0 cm wide; involucre hemispherical, in dry condition 6–7 mm long and 1.3–1.5 cm wide; ligules 1.5(1.7) cm long. Pappus white or dirty white, as long as central disk florets.......................10. **A. tataricus** L. fil.

+ Capitula larger, 4.0–4.5(5.0) cm wide. Pappus reddish, somewhat longer than disk florets. Ligules 2.0–2.2 cm long............... ....11. **A. fauriei** Lev. and Vaniot

14. Stem erect, 45(85) cm high. Capitula in loose corymbs or only two or three; involucre broadly hemispherical; involucral bracts dry; glabrous, with purple pubescence at tip, imbricate................. ....12. **A. maackii** Rgl.

+ Stems much shorter. Capitula solitary, less often in clusters of two to five in corymbs. Involucral bracts almost identical, three-rowed, or outer ones slightly shorter, herbaceous, more or less dry at base, densely pubescent throughout................................15

15. Rhizome horizontal with many stolons. Plants 2–8(18) cm high. Leaves entire or somewhat toothed...16

+ Rhizome horizontal, without stolons. Plants up to 25–40 cm high. Cauline leaves large (10 cm long), sharply toothed.............. ....13. **A. sibiricus** L.

16. Stems several. Leaves somewhat serrate-toothed or undivided, dorsally pubescent with thin, curved, grayish hairs................. ....14. **A. subintegerrimus** (Trautv.) Ostenf. and Resvoll

82 + Stems solitary. Leaves entire, on both sides almost glabrous. Usually small plants (5–10 cm high)....................................... ....15. **A. richardsonii** Spreng.

17. Lowermost basal leaves persisting up to flowering, wide, almost rotund-ovate.................................16. **A. suputinicus** Tamamsch.

+ Lowermost leaves shedding before flowering, and absent...........18

18. Stems many, arising from erect rhizome. Middle cauline leaves oblong-lanceolate, 10–12 cm long and 3–6 cm wide, upward along stem gradually decreasing in size. Ligules sky-blue or bluish..17. **A. ageratoides** Turcz.

+ Stem usually single, arising from tapering rhizome. Cauline leaves much larger than in preceding species; uppermost leaves abruptly reduced...19

19. Middle leaves ovate, very large, 17–18 cm long, coarse, lamina round at base, with thick and strong petiole; leaves in inflorescence on peduncles broadly-ovate, ovate, or elliptical......... ....18. **A. luxurifolius** Tamamsch.

+ Leaves on peduncles and at base of capitula narrowly lanceolate, undivided or finely serrate-toothed, with long attenuate tip..20

20. Ligulate florets white. Capitula in more or less downwardly compressed panicle, with very thin and somewhat sinuate, peduncles of second order unequal in length...21. **A. sutschanensis** Kom.

+ Ligulate florets violet or lilac. Capitula in compound corymbs on straight, short, strong peduncles of second order..................21

21. Ligulate florets violet. Capitula in small number, not more than 10, in simple corymbs. Lower leaves with long, winged petioles ....19. **A. see-burejensis** Tamamsch.

+ Ligulate florets much brighter, lilac. Capitula many, in compound corymbs. Leaves much larger on short, winged petioles ....20. **A. pensauensis** Tamamsch.

22. Capitula small; ligules of peripheral florets undeveloped or very short, shorter than involucral bracts...23. **A. tolmatschevii** Tamamsch.

+ Capitula large (up to 5–6 cm wide); ligules of peripheral florets usually well developed..23

23. Plants bright green and gray due to coarse, dense pubescence; lower leaves clustered in upward directed rosettes, very narrow (less than 1 cm wide)...........24. **A. serpentimontanus** Tamamsch.

+ Plants dark green, pubescent but hairs not stiff; basal leaves not clustered in rosettes and usually not directed upward, but arranged in more or less spreading rosette, round or spatulate...24

83 24. Plants up to 36–40 cm high, somewhat pubescent, mostly with appressed hairs. Shoots strong, stiff, near rhizome covered with previous year's leaves, with dense rosette of large round and broadly elliptical leaves. Ligulate florets two times as long as involucre, pinkish lilac..................25. **A. korshinskyi** Tamamsch.

+ Plants 15–30 cm high, more densely pubescent, particularly below capitulum. Shoots (floral scapes) thinner and not as strong as in preceding species. Leaves in rosette narrower....................25

25. Stems 25–30 cm high, purple or brownish-purple, with long curly, shining, intertwined hairs particularly below capitulum, cylindrical, rather deeply and uniformly sulcate, almost always straight. Ligules dark, violet....................26. **A. fallax** Tamamsch.

+ Stems 15 cm high, less often taller (up to 25 cm), green, usually pubescent below capitulum with long isolated hairs. Ligules bright, pinkish or bluish, three times as long as involucral bracts..22. **A. alpinus** L.

Section 1. GENUINI Nees, Gen. et sp. Aster (1832) 52. —Achene glabrous or somewhat pubescent with isolated stiff hairs; if achene more densely pubescent, then involucral bracts densely pubescent with simple and glandular hairs. Plants with very woody branches. Involucral bracts many-rowed.

1. **A. novi-belgii** L. Sp. pl. (1753) 877; Grossh. Opredel. (1949) 440; Vizn. Rosl. URSR, 523.

Perennial. Stem 25–150 cm high, hard, thick or thin, arising from long prostrate rhizome; stem except in uppermost part and capitulum, glabrous or distinctly pubescent along ribs from leaf bases. Leaves elliptical, lanceolate, or linearly lanceolate, sessile and more or less amplexicaul with auricles at base, sometimes narrowed towards base, sharply serrate or sometimes undivided, glabrous except densely pubescent margin, thick, strong, 4–17 cm long, 4–25 mm wide; lower leaves reduced and often deciduous. Capitula solitary or in racemes; peduncles covered with small apical leaves. Involucre glabrous, 5–10 mm long, hemispherical or somewhat infundibuliform, bracts obtuse or acuminate, more or less imbricate, sometimes with their upper ends curved, two or three-rowed; ligulate florets 15–20 (less often 40), usually blue, sometimes pink or white, mostly 5–14 mm long. Achenes usually glabrous, sometimes slightly pubescent, with indistinct vein; pappus whitish, of equal bristles. Flowering IX–X.

Cultivated as an ornamental plant.

Comes from North America and also described from there. Type in London.

84 2. **A. parviceps** (Burg.) Mackenzie and Bush, Fl. Jacks. Country (1902) 196. —*A. depauperatus* var. *parviceps* Gray, Synopt. fl. N. Amer. (1884) 39. —**Ic.**: Britt. and Braun. Fl. N. A. et Can. III (1913) 431.

Perennial. Plants slender with short simple rhizome and slender filiform roots; stem 30–80 cm high, usually sparsely hairy, less often almost glabrous. Leaves usually glabrous or more or less hairy, undivided or somewhat finely toothed. Basal and lower cauline leaves fugaceous, less often persistent and then oblanceolate and petiolate; upper leaves mostly sessile or sometimes narrowed into petiole-like base, sometimes almost linear, up to 10 cm long and 6 cm wide; upper leaves on branches numerous and greatly reduced, small leaves on peduncles linearly lanceolate. Capitula numerous in compact, compound, paniculate inflorescence, on short or somewhat long and densely leafy peduncles; involucre glabrous, narrowly obconical, compressed, 4–5 mm long; involucral bracts imbricate with greenish tip, often revolute along margin; capitulum with 18–30 florets, 12–18 of them ligulate;

ligules white, 2.5–3.0 mm long. Achene very slightly pubescent. Flowering IX–X.

Introduced. Weedy places. —*Caucasus*: Western Transcaucasia (south). *General distribution*: North America. Described from North America.

3. **A. laevis** L. Sp. pl. (1753) 876; Cronquist in Ill. Fl. of the North. Unit. St. and adjac. Canada, 3 (1952) 454; Grossh. Opredel. (1949) 440.

Perennial. Stem 30–100 cm high, arising from thick, short rhizome or from branched root collar; entire plant glabrous except peduncles, pubescent along ribs or ridges. Leaves highly variable in size, but usually largest ones about 1 cm wide, thick and dense, sessile or more or less with large auricles at base, entire or sometimes toothed; lower leaves narrowed into winged petiole and slightly broader, upper ones in inflorescence greatly reduced to size of bracts and usually broader at base. Capitula solitary or numerous in open inflorescence; involucre 5–10 mm long, involucral bracts stiff, appressed, acuminate, distinctly imbricate, in several rows, with short, green, somewhat rhomboidal tip; ligulate florets 20–25, white or purple, 8–15 mm long. Achene glabrous or subglabrous; pappus white or reddish. Flowering IX–X.

Dry open places; introduced. Reported from the Caucasus (Sochi). *General distribution*: North America. Described from North America. Type in London.

4. **A. salignus** Willd. Sp. pl. III (1800) 2040; Krylov, Fl. Zap. Sib. XI, 2668 . —*A. salicifolius* Scholl. Fl. Barb. Suppl. (1787) 328 non Lam.; Schmalh. Fl. II, 42; Vizn. Rosl. URSR (1950) 523; Majevski, Fl.
85 Sr. Pol. Evrop. Ch. SSSR (1954) 563. —*A. praecox* Meinsh. Fl. ingr. (1878) 156.

Perennial. Rhizome long, horizontally creeping with numerous slender roots. Stem solitary, erect, smooth, cylindrical in lower part, slightly longitudinally ribbed, in upper part usually branched, up to 100 cm high. Leaves lanceolate, more or less acuminate, along margin rough, sharply toothed mostly from center upward or along entire margin; lower leaves narrowed at base, upper ones undivided, sessile and semiamplexicaul; lamina of middle cauline leaves 5–12 cm long and 1–3 cm wide. Capitula medium-sized aggregated into more or less dense panicles; involucral bracts three- or four-rowed, linearly lanceolate, glabrous or with isolated cilia along margin. Ligulate florets lilac or white, ligules 1 mm wide; tubular disk florets bright yellow. Achenes small, somewhat hairy, with three indistinct ribs. Pappus white or yellowish, three or four times as long as achenes. Flowering VIII–IX.

River banks, in willow thickets, in wet places, near marshes.—*European Part:* Dvina-Pechora, Baltic Republics, Ladoga-Ilmen, Upper Volga-Kama, Upper Dniester, Middle Dniester, Black Sea Region; *Western Siberia*: Ob Region (Tomsk, rarely), Irtysh. *General distribution*: Western Europe. Described from Western Europe. Type in Berlin.

Note. The specimens of *A. salignus* from our northern regions most resemble western European specimens of this species. As regards the regions of Central Russia, plants collected from these regions are similar to specimens recorded for Poland. They are distinguished by a broader and thinner leaf blade and strongly serrate margin.

There is hardly a basis for supposing, as some taxonomists did at one time, that the species was introduced to Europe. In his time, A. Gray considered this plant to be a variety of *A. paniculatus* Lam., introduced into Europe. However, the general habit and depauperate inflorescence with mostly violet ligules make it possible at a glance to distinguish European specimens from American ones.

Section 2. AMELLUS Nees, Gen. et Spec. Ast. (1832) 30.—Achenes densely pubescent. Capitula in compound corymb, panicle, or less often in raceme. Involucral bracts three-rowed (less often four-rowed); outer bracts shorter than inner ones, with distinct, greenish, often colored appendage, pubescent or glandular-hairy. Bristles of pappus equal or almost equal to each other. Receptacle alveolate, with undivided or notched, membranous fringe. Appendages of style branches lanceolate.

Series 1. Novae-angliae Tamamsch. — Involucral bracts glutinous due to glands. Seven North American species belong to this series, of which we have only one.

86 5. **A. novae-angliae** L. Sp. pl. (1753) 875; Grossh. Opredel. (1949) 440; Vizn. Rosl. URSR (1950) 523.

Perennial. Rhizome thick, short, prostrate, with numerous slender roots. Stems 30 cm to 2 m high, arising in clusters, at base sparsely pubescent, upwards glandularly pubescent, strong, branched at tip. Leaves lanceolate, undivided, 3–12 cm long, 6–20 cm wide, sessile, slightly amplexicaul, with auriculate base, scabrous, in upper part glandular and with stiff appressed hairs (on both surfaces with shorter hairs); lower leaves similar to cauline leaves, but fugaceous. Capitula solitary (in cultivated forms) or in densely leafy short racemes; involucre 6–10 mm long and, like peduncles, densely glandular or slightly or more densely hairy; involucral bracts numerous, thin, almost equal, green, often reddish with thin papery base and attenuate into recurved tip, outer bracts somewhat broader, more herbaceous, leafy, and less attentuate apically than others; ligulate florets 45–100, ligules broad, reddish or pink, less often blue or white, usually 1–2 cm long. Achenes densely pubescent, with silvery, appressed hairs, ribs indistinct. Flowering VIII–X.

Cultivated in gardens and parks, sometimes escapes and is found in weedy places. *General distribution*: North America. Described from North America. Type in London.

Series 2. Amelliae Tamamsch. —Involucre pubescent, but without glands. Bracts herbaceous, with apical appendages.

6. **A. amellus** L. Sp. pl. (1753) 1226; M.B. Fl. taur.-cauc. II (1808) 311; Ldb. Fl. Ross. II, 476; Boiss. Fl. or. III, 157; Schmalh. Fl. II, 41; Krylov, Fl. Zap. Sib. XI, 1667; Grossh. Fl. IV, 93, p. p.—*A. trinervius* Gilib. Fl. Lithuan. III (1781) 214, non Roxb.—?*Galatella strigosa* Weinm. in Bull. Soc. Nat. Mosc. II (1850) 546. —**Ic.**: Hegi, Ill. Fl. VI, I (1915) t. 259, 3. —**Exs.**: GRF No. 2759b.

Perennial. Plants green, almost glabrous or scabrous, short pubescent. Rhizome short, thick, cylindrical, and oblique. Stem 20–60 cm high, straight, usually simple, reddish, usually somewhat pubescent or glabrous, leafy throughout. Lower leaves obovate, spatulate, obtuse, undivided, narrowed toward base into petiole, greenish or bluish because of stiff hairs; middle and upper cauline leaves obtuse but with cusp at tip, undivided or sometimes with sparse coarse teeth; uppermost leaves reduced in size, sessile and, like other leaves, distinctly three-veined. Capitula rather large, 3–5 cm wide, in simple corymbose panicles; involucre broad, hemispherical, 12–18 mm wide, imbricate; involucral bracts scabrous, three- or four-rowed; outer ones shorter, spatulate, green, 87 ciliate along margins and almost glabrous on back, with apical appendage; inner involucral bracts longer than outer ones, lanceolate, almost entirely membranous, purple at tip or entirely colored. Ligulate florets almost two times as long as involucre, linearly lanceolate, violet or blue, 5–15 mm long, with short tube; disk florets yellow, tubular, 5–6 mm long. Achenes 2–3 mm long, densely appressed hairy, with indistinct vein; pappus white, two times as long as achene. Flowering VII–IX.

Edges of forest, scrubs, groves, calcareous slopes. —*European Part*: Baltic Regions, Ladoga-Ilmen, Volga-Kama, Upper Dnieper, Volga-Don, Trans-Volga; *Western Siberia*: Upper Tobol. *General distribution*: Atlantic and Central Europe, Mediterranean. Described from northern Italy. Type in London.

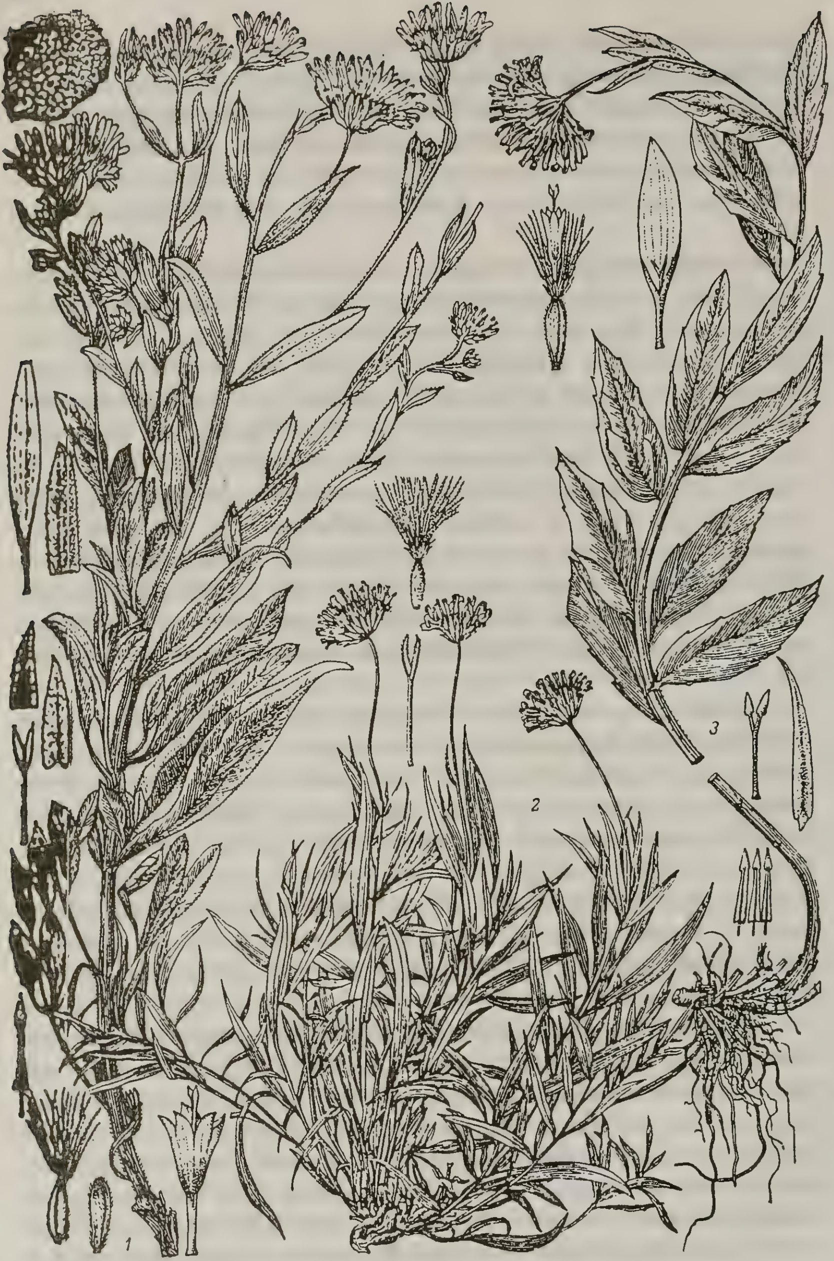
7. **A. amelloides** Bess. Enum. Volh. (1822) 33; Grossh. Opredel. (1949) 440; Vizn. Rosl. URSR (1950) 523.—*A. bessarabicus* Bernh. ex Rchb. Fl. excurs. (1831) 246.— *A. amellus* var. *bessarabicus* DC. V (1836) 231.—*A. amellus* var. *major* Ldb. Fl. Ross. II (1844) 476.—*A. amellus* var. *amelloides* Schmalh. Fl. II (1897) 41; Grossh. Fl. IV, 93.— *A. amellus* var. *daghestanicus* Kem.-Nat. in Tr. Tifl. Bot. Sada, I (1934) 96.

Perennial. Rhizome often horizontal, with rosette of leaves; plant grayish due to rather dense pubescence; hairs stiffer than in *A. amellus* and somewhat appressed. Stem, 60–70 cm high, branched in upper part. Lower leaves rather orbicular, lamina 10–12 cm long, 2–4 cm wide, lanceolate, undivided or somewhat sparsely toothed, narrowed into petiole up to 10 cm long, scabrous due to stiff hairs, with three veins distinct on dorsal side, sometimes cuspidate; middle and upper leaves reduced, middle leaves three-veined, upper leaves with single prominent vein. Capitula many in inflorescence; peduncle long; involucre hemispherical; involucral bracts three- or four-rowed; middle and inner ones and sometimes outer also coriaceous, acuminate, and densely pubescent on back; ligulate florets blue or pinkish-blue like tubular disk florets, in other characters similar to florets of preceding species. Flowering VIII–IX.

Scrubs and on dry slopes.—*European Part*: Middle Dnieper, Bessarabia, Black Sea Region, Crimea, Lower Don, Lower Volga. *Caucasus*: Ciscaucasia, Dagestan; Southern Transcaucasia (northern part); *Soviet Central Asia*: mountainous Turkmenia (rarely). *General distribution*: Central Europe. Described from Bessarabia. Type in Leningrad.

8. **A. ibericus** Stev. in MB. Fl. taur.-cauc. II (1808) 311; Grossh. Fl. Kavk. IV, 93; Kem.-Nat. Tr. Tifl. Bot. Inst. I (1934) 87. —*A. amellus* f. *ibericus* Nees, Gen. Ast. (1832) 45; DC. Prodr. V 231; Boiss. Fl. orient. III, 157.

Perennial. Rhizome long, oblique or straight; usually many-stemmed. Stems 20–80 cm high, simple or branched, densely leafy, entire plant rough
88 and glaucescent because of dense pubescence. Lower leaves up to 10 cm long, with long petioles indistinctly transitional to lamina, grayish on both sides, densely pubescent, oblong-lanceolate, with three distinct veins; middle leaves narrowed into long winged petiole, lamina lanceolate, also densely pubescent on both sides, entire or, like lower leaves, sometimes with occasional teeth and with three distinct veins; upper leaves always entire, narrowed or slightly broadened toward base. Capitula in simple corymbs, on long peduncles, large, up to 3–5 cm wide; peduncles with or without leaves or bearing one or two small leaves almost directly below capitulum; involucral bracts two- to four-rowed, herbaceous, greenish-



89 Plate VI.

1—*Aster ibericus* Stev., habit, receptacle, ligulate floret, involucral bract, style, stamen, achene with and without pappus, tubular floret; 2—*Kemullariella tugana* (Alb.) Tamamsch., habit, achene with double pappus, style; 3—*K. caucasica* (DC.) Tamamsch., habit, achene with tubular floret, ligulate floret, style with appendage, involucral bract, stamen.

gray, sometimes colored, lanceolate, acute; outermost bracts obtuse, somewhat shorter than inner ones, on back and particularly at tip densely pubescent; innermost involucral bracts sometimes somewhat purple; peripheral ligulate florets numerous, up to 13 mm long, two times as long as disk florets, blue, pinkish, or sky-blue. Achenes, up to 4 mm long, hairy; pappus two times as long as achene, hairs white, sometimes yellowish. Flowering VIII–IX. (Plate VI, Fig. 1).

Mountain meadows, edges of forest, sometimes reaches to 2,000 m. —*Caucasus*: Dagestan, Western, Eastern, Southern Transcaucasia, Talysh. *General distribution*: Eastern Anatolia. Described from Georgia. Type in Helsinki.

Note. A highly ornamental plant, it certainly is a prospect for horticulture. As already noted by Koch (Linnaea, 1849), the capitula of this species are larger and more beautiful than those of *A. amellus* L. This species varies in a number of characters. Kemularia-Nathadze having specially studied this species on the basis of numerous Caucasian collections recognized several forms, of which the particularly interesting ones are: 1) var. *coloratus* Kem.-Nat. (from Stepanovan), distinguished by a reddish stem, expanded auriculate bases of the uppermost leaves, very large capitula, and colored, acuminate involucral bracts; 2) var. *hirsutus* Kem.-Nat. (from Kazbek Station), is characterized by a smaller stature, 2–3-seriate, acute involucral bracts, and particularly by the fact that the upper leaves along the veins and margins, as well as the stem are covered by dense, articulate, and spreading hairs.

Series 3. Glehnianae Tamamsch. —Series *Euorthomeris* Torr. and Gray. Fl. North Amer. II (1841) 157 p. p. —Leaves oblong or ovate, 91 long- or short-petiolate, apically long attenuate, toothed or sinuate-toothed. Capitula in broad corymbs. Involucre hemispherical, bracts two- or three-rowed, linearly lanceolate, acuminate, imbricate, inner ones shorter than disk florets. Alveolae of receptacle with interrupted margin. Style appendages lanceolate. Achene compressed, long, glandular, and hairy. Pappus of numerous hairs, shorter than the disk [sic.].

9. **A. glehnii** Fr. Schmidt Reis. im Amurl. und Sach. (1868) 146; Fr. and Sav. Enum. Pl. Jap. 1 (1875) 223 p. p.; Tatewaki, Phytogeogr. Middle Kuriles (1933) 213; Kitamura, Comp. Jap. I (1937) 330. —*A. korsakoviensis* Lév. and Van. in Fedde, Repert. VII (1909) 103.—**Ic.**: Sugawara, Ill. pl. of Saghal. IV (1940), tab. 809.

Perennial. Rhizome horizontal, thickened, woody, root collar covered with fibers. Stem decumbent, 1.0–1.5 m high, at tip sparsely branched, finely pubescent. Lower leaves deciduous; middle cauline leaves numerous, densely arranged, oblong, 13–20 cm long, 4–6 cm wide, apically attentuate, narrowed downward, short-petiolate, finely and sharply toothed; ventrally green and rough, dorsally paler, punctate, finely pubescent; upper leaves gradually narrowed and reduced, linear below inflorescence. Capitula numerous in corymbs, on slender peduncles, with brownish pubescence; involucre up to 9 mm long and 7 mm wide, broadly tubularly infundibuliform, involucral bracts two- or three-rowed, green, almost equal; outer bracts with cusp, densely pubescent on back; inner ones slightly pubescent, apically attentuate, scarious. Ligulate florets one-whorled, corolla white, 9–10 mm long, 1.5–2.0 mm wide with narrow tube, outwardly pilose with long hairs; disk florets uniformly toothed, pubescent on outer side. Achene linearly oblong, 3 mm long, 0.8 mm wide, highly compressed, ribbed along edge, usually dotted with glands, at tip round-notched, narrowed toward base; pappus dirty white, 4.5 mm long; bristles not exactly equal, narrowed upward. Flowering VII–IX.

Rocky places in river valleys. —*Far East:* Sakhalin and Kuril islands. *General distribution:* Japan. Type in Leningrad.

Note. Kitamura (loc. cit.) mentions the occurrence of this species in Eastern Siberia. We could not find any proof of this, either in other literature sources or in the herbarium specimens at our disposal.

A. glehnii Fr. Schm. differs quite sharply from other species of section *Amellus* by its general habit and details of morphological structure. Some specimens deviate somewhat from the type. Thus, for example, specimens from Shikotan Island differ from the Sakhalin specimens by having a more slender, flexuous stem, a more lax inflorescence with very slender peduncles, and more narrow, entire, long-acuminate 92 leaves. The South Sakhalin specimens collected by M.G. Popov from Graphite Gorge have still more lax inflorescences, but considerably smaller leaves with a weakly toothed margin and shorter acuminate apex.

Series 3*. Macrocephali Kitam. in Journ. Jap. Bot. XII (1936) 533. — Involucre large, hemispherical, bracts three-rowed, imbricate, on back herbaceous; outer bracts obtuse, pinkish; inner bracts equal to those of disk. Edges of alveolae of receptacle entire. Achene obovoid, compressed, hairy or sometimes slightly glandular. Capitula large, with long ligules, terminal. Leaves linear, almost sessile.

10. **A. tataricus** L. f. Suppl. pl. (1781) 373; DC. Prodr. V, 230; Ldb. Fl. Ross. II, 475; Turcz. Fl. baic.-dah. II, 10; Maxim. Prim. fl. Amur. (1859) 144; Miq. in Ann. Mus. Bot. Lugd.-Bat. II, 168; Kom. Fl.

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*[sic]; recte Section.—General Editor.

Manchzh. III, 592; Kitagawa, Index Fl. Jehol. (1936) 53; Kitamura, Comp. Jap. I (1937) 333. —*Aster trinervius* var. *longifolia* Fr. and Sav. Enum. Pl. Jap. I (1875) 222. —*A. tataricus* var. *minor* Makino in Tokyo Bot. Mag. XXII (1908) 166; Nakai, Fl. Sylv. Kor. XIV (1923) 104.

Perennial. Rhizome short, inconspicuous, root collar thickened, densely covered with fibrous roots. Stem 1.0–1.5 m high (in cultivated forms up to 2 m), straight; angular below, simple, glabrous, branched above, with isolated stiff hairs, branches slender, ascending. Basal leaves shedding before flowering, long-spatulate, obtuse, narrowed toward base with winged petiole, broadly and coarsely toothed, ventrally green and wrinkled, dorsally pale, hispid; lower cauline leaves long-petiolate, 25–35 cm long, 6–10 cm wide, obovate, short-acuminate, toward base reduced, sessile or petiolate; upper leaves gradually reduced, almost sessile, lanceolate or linearly lanceolate, acuminate below inflorescence, linear, 3–5 mm long. Capitula in loose corymbs on long, slender peduncles, densely and coarsely pubescent; involucre hemispherical; bracts three-rowed; outer ones somewhat shorter, all lanceolate, acuminate, on back pubescent, along edge somewhat cartilaginous, upward and sometimes along margin reddish. Corolla of ray florets blue or pinkish-purple, 16–17 mm long, tube glabrous; disk florets with narrow tube, not uniformly toothed; style appendages triangular. Achenes slightly compressed, dark purple, obovoid, obtuse at tip and narrowed downward, with two ridges above, very hairy; pappus whitish or reddish, about 6 mm long, its numerous bristles slightly unequal, scabrous, erect, white, sometimes dirty white. Flowering VII–IX.

Meadows, river banks, shrubby thickets, and forest edges. —*Eastern Siberia*: Dauria. *Far East*: Zeya-Bureya, Uda River area, Ussuri. *General distribution*: Mongolia, Korea, China, Japan. Described from Eastern Siberia. Type in London.

93 11. **A. fauriei** Lev. and Vaniot in Fedde Repert. VII (1909) 102. —*A. tataricus* Fr. Schmidt Reise im Amurl. und Sachal. (1868) 146 non L. f. nec Lev. and Van. —*A. tataricus* var. *fauriei* Kitamura, Comp. Jap. I (1937) 334. —**Ic.**: Sugaw, Ill. Fl. of Sagh. IV (1940) t. 808.

Perennial. Rhizome short, oblique, root collar covered with old base of petioles of lower leaves. Stem up to 1.5 m high, erect, finely sulcate, thick, up to 5 mm at base, glabrous, branched above with sparse coarse hairs. Basal leaves shedding before flowering very long, spatulate, large, sometimes up to 50 cm long, obtuse, but narrowed toward base into long, winged petiol repand and with sparse bristles, dorsal surface more pale green than ventral and not so wrinkled and rough; lower leaves long-petiolate, large, 20–35 cm long and 6–10 cm wide, ovate or oblong, with small notch at tip, at base round-compressed or narrowed into petiole, sharply toothed, ventral surface wrinkled, petiole winged in upper part, 10–20 cm long; upper leaves gradually reduced, almost sessile, narrow, oblong or oblong-lanceolate, attenuate apically; leaves in inflorescence linear. Inflorescence corymbose. Capitula 40–45 mm thick, on long peduncles, up to 3.0–3.5 cm long; bracts as well as peduncles densely and coarsely pubescent; involucre hemispherical, about 10–20 mm thick, two-rowed, outermost involucral bracts up to 5 mm long, lanceolate, like inner ones, pubescent on outer side, scarious along margin, acuminate; receptacle convex, alveolae with broken membranous margin. Ray florets one-whorled, corolla large, up to 20–22 mm long, tube 4 mm long, glabrous on outer side; disk florets yellow, tubes 3–4 mm long, all lobes of limb not equal; anthers obtuse at base; styloides triangular at tip. Achenes flat, more or less compressed, dark and brownish-purple, at tip roundly truncated, narrowed downard, two-veined, densely hairy throughout; pappus long, dirty white, of stiff hairs, 6–7 mm long, at tip slightly roughened and attenuated.

Shores and wet meadows. —*Far East*: Sakhalin. Endemic. Described from Otomari on Sakhalin. Type in Paris.

12. **A. maackii** Rgl. in Mém. Acad. Pétersb., sér. VII, IV (1861) 81.— Korsh. in Tr. Peterb. Bot. Sada, XII, 39; Kom. Fl. Manchzh. III, 601; Nakai, Fl. Sylv. Koreana XI, 104; Kitamura, Comp. Jap. I, 332. — *Aster horridifolius* Lév. and Vanio in Bull. Acad. Geogr. Bot. XX (1901) 141. —*A. koidzumanus* Makino in Tokyo Bot. Mag. XXI (1907) 16.

Perennial. Rhizome horizontal, root collar with dense fibrous roots. Stem erect, 40–85 cm high, reddish, finely sulcate, sparsely and coarsely hairy, densely leafy, branched in upper part, corymbose, branches ascending. Basal and lower leaves shedding after flowering; cauline leaves 94 lanceolate, attenuate above and sometimes acuminate, narrowed toward base, sessile, sharp-toothed often narrowly revolute, ventral surface green, dorsal surface pale, densely hispid, almost all leaves three-veined, thick, fragile; upper leaves gradually reducing, lanceolate, on branches narrowly lanceolate, 1.5–2.0 cm long, obtuse, undivided. Capitula large, 4 cm wide, in broad corymbs on long peduncles, hairy with dense and stiff hairs and bearing bracts in upper portion. Involucre hemispherical, up to 2 cm wide, bracts three-rowed loosely imbricate; inner ones scaly, purple upward, on back glabrous; outer bracts narrow, shorter, obtuse, along margin narrowly cartilaginous. Ray florets pistillate, one-whorled; corolla up to 2 cm long, 2.0–2.5 mm wide; tube slightly hairy on outer side; disk florets with narrow tube and short teeth, 1 mm long; appendages of style branches elongated, obtuse. Achenes obovoid, 1 mm long, at tip roundly truncate, at base narrowed; densely pilose, fringed along sides, less often ribbed above; pappus reddish. Flowering VIII–X.

Wet mountain meadows. —*Far East*: Zeya-Bureya, Ussuri, Uda River area, Sakhalin. *General distribution*: Northern China. Described from Northern China. Type in Leningrad.

Economic Importance. Ornamental plant.

Note. Forms have been noted in which the large terminal leaves cover the involucre itself; also, large highly branched plants are found (vicinity of Vladivostok).

13. **A. sibiricus** L. Sp. pl. (1753) 872; DC. Prodr. V, 231; Ldb. Fl. Ross. II, 475; Korsh. in Tr. Peterb. Bot. Sada, XII, 349; Fr. Schmidt. Reise Amurl. u. Sach (1868) 49; Kom. Fl. Manchzh. III, 595; Fl. Kamch. 121; Kitamura, Comp. Jap. I, 335; Krylov, Fl. Zap. Sib. XI, 2668, p. p. —*A. sibiricus* f. *laricetorum* Kom. Fl. Kamch. (1930) 122. —*A. ircutianus* DC. Prodr. V. (1836) 229. —*A. prescottii* Lindl. in DC. Prodr. V (1836) 230; Ldb. Fl. Ross. II (1845–1846) 475. —*A. richardsonii* Ldb. Fl. alt. (1833) 96; Fl. Ross. II (1845) 475, non Spreng. nec Schmidt. —*A. sachalinensis* Kudo, Rep. Veg. N. Saghal. (1924) 226; Sugawara Fl. Saghal. IV, 1771. —**Ic.**: Gmelin, Fl. sib. II (1749) 186, tab. 80, fig. 1; Sugaw. op. cit. tab 811.

Perennial. Rhizome thin, horizontal. Stem 25–40 cm high, finely sulcate, somewhat ribbed, somewhat decumbent, often reddish, densely pubescent with appressed, short but curly hairs, sometimes branched at tip. Lowermost leaves small, scaly, shedding before flowering; middle and upper cauline leaves lanceolate, cuspidate, narrowed downward, sessile or petiolate, sharp-toothed, their lamina green, on ventral side less pubescent, on dorsal side with prominent veins; upper leaves gradually reducing, often closely arranged. Capitula solitary, on simple or branched stems, with long or short peduncles. Involucre hemispherical, 7 mm wide; involucral bracts three-rowed, almost equal, or outer ones somewhat shorter, lanceolate, with prolonged tip, on back herbaceous, 95 one-veined, densely pubescent, with long cilia along margin, particularly in upper half; at tip reddish; corolla of tubular florets slightly pinkish-yellowish, that of ligulate florets blue or violet, glabrous. Pappus reddish, 7.0–7.5 mm long; bristles numerous, slightly roughened, slightly thickened at tip, outer ones sometimes shorter than inner ones. Achenes pilose, sometimes with isolated glands, 1/2 length of pappus. Flowering VI–VII.

On plains in tall herbaceous vegetation, in bright deciduous and larch forests. —*European Part*: Volga-Kama; *Western Siberia*: Upper Tobol, Irtysh, Altai; *Eastern Siberia*: Angara-Sayans, Dauria; *Far East*: Zeya-Bureya, Uda River area, Ussuri, Sakhalin and Kuril islands. *General distribution*: Japan, China, Korea. Described from Siberia. Type in London.

Note. A highly polymorphic species, it is extremely broadly interpreted by many authors. However, the morphological characters, coupled with the geographical distribution and the unique habitats, make it possible to recognize races that were described earlier as separate species or varieties. Sometimes we come across luxuriant individuals with many capitula, which usually are identified as *A. sibiricus* var. *pleiocephalus*.

A. flexuosus Fisch. *Mém. Soc. Nat. Mosc.* III, 1812, 73 (non Nutt. 1818), described from Siberia and renamed by De Candolle as *A. fischerianus* DC., remains a mystery because of the absence of authentic specimens and only tentatively may be considered as synonym of *A. sibiricus* L.

14. **A. subintegerrimus** (Trautv.) Ostenf. and Resvoll in Nyt. Magazen Naturvidenskaberne, 54 (1916) 163. —*A. sibricus* var. *subintegerrima* Trautv. in Middend. Reise I (1847) 161. —*A. montanus* Rupr. Fl. Samoj. cisural. (1846) 39, non Nutt., nec Richardson. —*A. sibiricus* Scheutz. in Kgl. svenska Vet. Akad. Handl. Bd. 22, 10 (1888) 10, non L. —*A. richardsonii* Schmidt in Mém. Acad. Sc. Pétersb. XVIII (1872) 105, non Spreng. nec Ldb. —*A. sibiricus* var. *riparius* Kom. in Fl. Kamch. III (1930) 122.

Perennial. Rhizome horizontal with many stolons. Stems many, decumbent or almost erect, 5–18 cm high. Leaves oblong-ovate or obovate; lower leaves petiolate, upper leaves sessile, more or less amplexicaul, slightly and indistinctly serrate-toothed or undivided, 2–5 cm long and 1–3 cm wide; on ventral side almost glabrous or somewhat scabrous because of isolated hairs, dorsally quite densely pubescent with fine, curved, grayish hairs; peduncles solitary or two, less often many, more or less angular, finely ridged, often reddish, somewhat pubescent; involucral bracts numerous, scarious or outer ones more or less herbaceous, oblong-ovate or oblanceolate, tips acute and often colored, pubescent on back, slightly ciliate along margin. Disk florets tubular with yellow corolla; peripheral florets with lilac ligules, nar-
96 rowly oblong or oblong-lobate; pappus as long as disk florets, dirty-grayish or somewhat reddish, two times as long as oblong, obovoid, flat achene, covered with upward directed hairs, Flowering VII–IX.

Steep open slopes, river terraces, gravel, stony plateaus. —*Arctic*: Arctic Europe, Anadyr; *European Part*: Karelia-Lapland, Dvina-Pechora; *Eastern Siberia*: Yenisei, Lena-Kolyma; *Far East*: Kamchatka, Okhotsk. *General distribution*: Scandinavia. Described from specimens from eastern Siberia and Norway. Type in Leningrad.

15. **A. richardsonii** Spreng. Syst. Veg. III (1827) 258; Hook. Fl. bor. am. II (1840) 7. —*A. espenbergensis* Nees, Gen. et Spec. Ast. (1832) 36. —*A. arcticus* East. in Bot. Gaz. 23 (1902) 295. —*A. meritus* A. Nels. in Bot. Gaz. 37 (1904) 268. —*A. sibiricus* Hulten, Fl. Alaska and Jukon X (1950) 1493 p. p. non L. —*A. sibiricus* f. *alpigenus* Kom. Fl. Kamch. III (1930) 121. —*A. sibiricus* f. *litoralis* Kom. ibid. —*A. sibiricus* var. *meritus* Raup. in Sargentia (1947) 240.

Perennial. Rhizome horizontal, branched, very long; stems generally solitary, sometimes several, 5–15 (less often 20) cm high, assurgent, sometimes procumbent up to half of its length, then erect. Plants often forming turf. Leaves small, 2.5 m long, 1–2 cm wide, almost glabrous, sessile, lanceolate, entire; narrowed into petiole, forming rosette. Capitula solitary; involucre hemispherical; lowermost involucral bracts often broad, leafy, green, large, enclosing two or three rows of more or less ovate inner bracts, somewhat pubescent, with colored tip. Tubular florets yellow, but bluish after flowering; peripheral florets usually with brightly colored blue or bluish-violet ligules. Pappus rusty-brown, as long as disk florets and two times as wide as ligulate florets. Achene half as long as pappus, densely pubescent. Flowering VIII–IX.

Talus slopes, alpine meadows, open treeless places. —*Arctic*: Chukotka, Anadyr; *Far East*: Kamchatka (north). *General distribution*: Alaska, Canada. Described from North America. Type in London.

Section 3 AGERATON Tamamsch. sectio nova. —Sect. *Euaster* Kitamura, Comp. Jap. I (1937) 325, p. p. —Leaves oblong-ovate, ovate, or linear, petiolate or sessile. Capitula in loose or compressed, compound or simple corymbs. Involucre infundibuliform, medium or small; involucral bracts two- or three- rowed, sometimes four-rowed, more or
99 less oblong, linear or ovate, somewhat herbaceous above or paper-thin and intensely colored, imbricate; innermost involucral bracts shorter than disk florets. Receptacle alveolate, edges of alveolae toothed; pappus somewhat shorter than disk, bristles numerous, sometimes unequal.

Note. The section is rich in species, the majority of which are found in Japan. For Japan only, Kitamura recognizes nine species with eight subspecies and a whole series of hybrids. Some of our species of this section, like the Japanese ones, are morphologically quite distinct, but at the same time they are so-called "sympatric," i.e., species whose ranges overlap or coincide with each other.

Series 1. Ageratoides Tamamsch. —Basal and lower cauline leaves persistent up to flowering and fruiting. Involucral bracts ovate. Capitula on erect, stiff peduncles.

16. **A. suputinicus** Tamamsch. sp. n. in Addenda XXIV, 591. —*A. lautureanus* auct. non Fr. and Sav. (1884). —*A. ageratoides* auct. non Turcz. (1837).

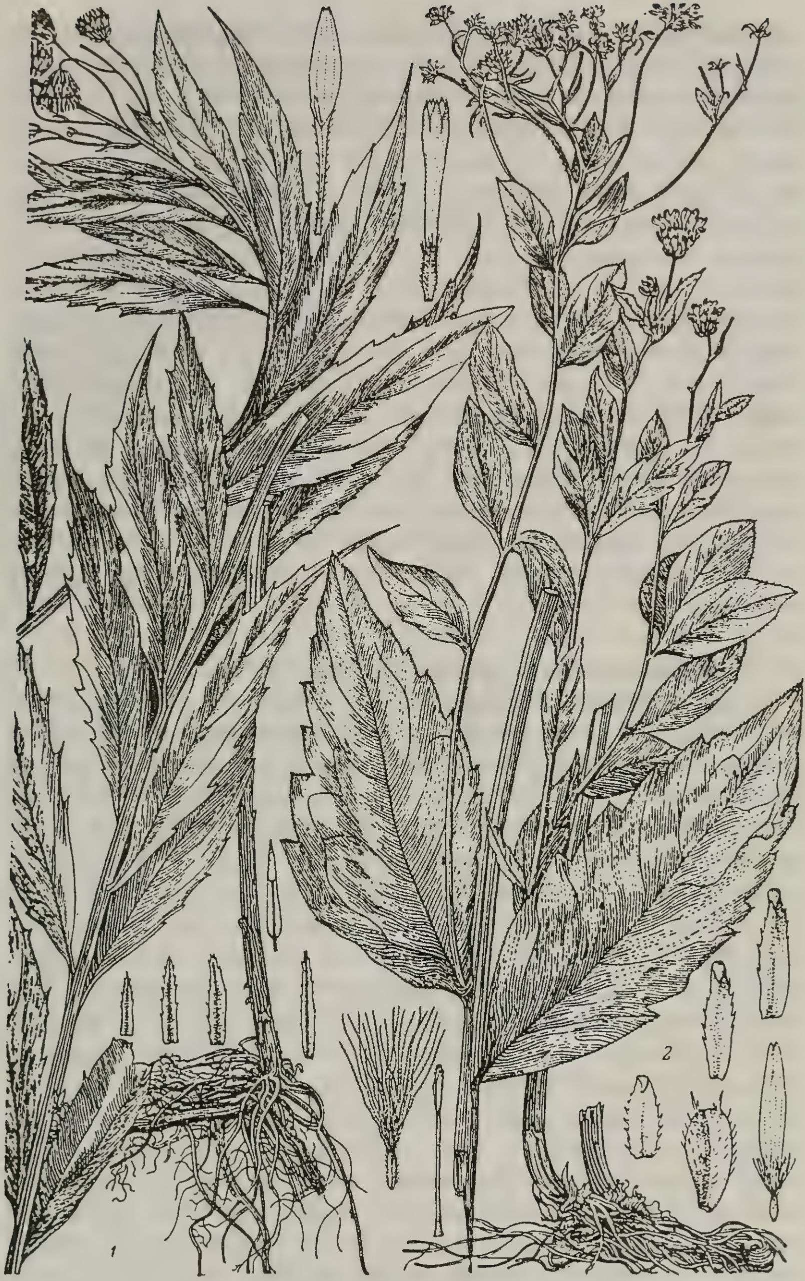
Pernnial. Rhizome rather thick, almost 1 cm, procumbent, densely covered, particularly in upper part, with slender roots; plant together with inflorescence hardly up to 30 cm high. Stem thin, round, erect but slightly sinuate, reddish-brown and glabrous below, gray, sparsely pubescent with stiff upward directed short hairs above. Basal leaves of different sizes, from 1 cm to 6 cm long and 3 cm wide; lamina in both types of leaves broadly ovate or almost orbicular, crenate, with sparse short, straight, obtuse teeth and partly with stiff acute cilia, ventrally dark green and somewhat pubescent with isolated appressed hairs, but dorsally much brighter; apart from that, both sides with very fine glands; all lower leaves on narrow-winged petioles with erect and downward directed stiff hairs; middle leaves oblong-ovate with cusp; lamina on ventral side much darker, on both sides scabrous because of stiff hairs, on short, broad petioles, almost undivided or less often coarsely and sharply toothed; upper leaves sessile, lanceolate. Capitula small, 1.0–1.5 cm wide, in compound corymbs; peduncles straight, thin, bearing small scarious bracts with entire margin; involucre broadly infundibuliform, consisting of imbricate, three- or four-rowed, narrow, stiff bracts, dark green at tip; ligules pinkish (when dry?) two times as long as involucre. Immature achene densely hairy, particularly along edges, and at tip with long upward directed appressed hairs; pappus chestnut-colored, consisting of stiff, almost equal hairs, half as long as ligules and more than two times as long as achene. Flowering VIII.

100 Uncultivated fields, edges of forest. —*Far East*: Ussuri (Okeanskaya Station, Suputinskii Preserve). Endemic. Described from Okeanskaya Station. Type in Leningrad.

Series 2. Euagerati Tamamsch. —Basal and lower leaves shedding before flowering. Middle leaves ovate or oblong-ovate, undivided or somewhat crenate. Capitula on erect, strong peduncles.

17. **A. ageratoides** Turcz. in Bull. Soc. Nat. Mosc. VII (1837) 154; Walp. Rep. II, 574; Maxim. Prim. Fl. Amur., 144; Herder in Bull. Soc. Nat. Mosc. I, 381; Kitagawa, Ind. Fl. Jehol. (1936) 52; Kitamura, Comp. Jap. I (1937) 345, p. p. —*A. trinervius* auct. non Roxb.: Kom. Fl. Manchzh. III, 594 Nakai, Fl. Koreana II, 10; Kom. and Al. Opredel. Rast. Dalnevost. Kr. II (1932) 1011. —*A. adustus* Koidzumi ex Nakai, Fl. Sylv. Koreana XIV (1923) 102, nom. sol.

Perennial. Rhizome oblique, thickened, densely covered with thin fibrous roots. Stem about 1 m high, finely sulcate, at base smooth,



97 Plate VII.

1—*Aster sutschanensis* Kom., habit, ligulate floret, tubular floret, involucral bract, stamen, achene with pappus, style; 2—*A. luxurifolius* Tamamsch., habit, involucral bract, achene of ligulate floret with pappus.

3–4 mm thick, more or less branched above, branches straight and divergent, scabrous. Basal and lower leaves shedding before flowering; middle cauline leaves oblong-lanceolate, 10–12 cm long, 3–6 cm wide, with long tip, short-petiolate, sparsely toothed, teeth cuspidate; lamina papery, ventrally green, scabrous, dorsally brighter and smoother, three-veined; upper leaves gradually reducing in size, lanceolate, with long tip, at base round, toothed; uppermost leaves small, up to 5 mm long. Capitula in compound corymbs on straight, scabrous, 12–30 mm long peduncles. Involucre infundibuliform, bracts three-rowed, imbricate, linearly oblong, dark purple above, more or less coriaceous, along margin ciliate, outermost bracts very short, not more than 2 mm long. Corolla of ray florets 10–11 mm long and 2 mm wide, blue. Disk florets yellow, small, 1.5–2.0 mm long, with unequal lobes of limb. Receptacle alveolate, alveolae membranous along edge. Achenes up to 2 mm long, compressed laterally, sometimes also from surface, one-veined; pappus brownish-purple, bristles distinctly toothed, unequal. Flowering VIII–IX.

Far East: Zeya-Bureya (along middle Amur), Ussuri. *General distribution*: Korea, Northern China. Described from Peking. Type in Leningrad.

18. **A. luxurifolius** Tamamsch. in Addenda XXIV, 579.

Perennial. Rhizome slightly oblique, densely covered with slender roots. Stems one or two, up to 1 m high, pinkish violet or dirty white, slightly sulcate, almost glabrous or somewhat scabrous due to isolated
101 glandular hairs, almost cylindrical below, somewhat angular and more scabrous above due to denser stiff hairs. Basal and lowermost cauline leaves shedding before flowering; middle leaves ovate, very large, coarse, lamina not papery as in preceding species, but more coriaceous, 17–18 cm long, 5.0–6.5 cm wide, with broad round base, on thick, short petiole up to 5 mm long, coarsely toothed and with somewhat revolute margin, ventrally much darker and more scabrous, more or less wrinkled, dorsally much brighter and less scabrous due to stiff, short glandular hairs, with three distinct veins, acuminate; upper leaves on branches and in inflorescence abruptly reduced, 3–5 cm long, broadly ovate, ovate, or elliptical, with highly recurved entire margin, on both sides and along margin very scabrous due to short, stiff, glandular hairs; ventrally much darker, dorsally much brighter, thick coriaceous, compact. Capitula in compound corymbs; corymb branches angular, with fine ridges, scabrous due to pubescence, much denser and tougher than on stems; involucre after flowering broadly infundibuliform, consisting of loosely arranged three-rowed bracts; involucral bracts with grayish-violet appendage at tip, recurved (particularly in innermost bracts), along margin without stiff hairs, on inner side glabrous, lustrous. Receptacle flat,

alveolate; alveolae membranous along edges, toothed. Ray florets bright violet, with up to 2 mm wide two-toothed or three-toothed ligule; disk florets tubular, almost symmetrically incised at tip. Achenes compressed, hairy; pappus chestnut-white, bristles distinctly toothed. Flowering IX. (Plate VII, Fig. 2).

Shrub thickets on stony slopes. —*Far East*: Ussuri (south). Endemic. Described from Svetloyarovka of Chernigov District. Type in Leningrad.

19. **A. see-burejensis** Tamamsch. nom. nov. —*A. ageratoides* var. *adustus* Maxim. Prim. fl. amur. (1859) 144. —*A. trinervius* var. *adustus* Kom. Fl. Manchzh. III (1907) 595.

Perennial. Rhizome oblique with numerous roots. Stem solitary, simple, up to 1 m high, but most often shorter, roundish below, finely ridged light pinkish-brown, almost glabrous; somewhat angular above, with thick ridges, and sparse cilia, more compactly clustered and projecting from axil of leaves. Inflorescence axis angular, brighter, with denser, tougher, upward directed, slightly bent, and appressed hairs. Basal leaves shedding before flowering; lower leaves on winged petioles as long as lamina, elliptical, acuminate, terminating in cusp, not deep but sparsely toothed like other leaves, ventrally darker, scabrous due to short stiff hairs, dorsally brighter, with sparse, white hairs thickened at base, and less scabrous, with three prominent veins; middle and
102 upper leaves almost sessile, much larger, up to 15 cm long and 4–5 cm wide, much deeply toothed with large teeth terminating in cusps, three-veined with distinct anastomosis; uppermost leaves below and on inflorescence abruptly reduced, acutely lanceolate, finely serrate-toothed, with long attenuate apex and cusped teeth. Capitula in corymbose inflorescence, approximately one-eighth as tall as plant; peduncles below capitula more densely pubescent, divergent at 45°, slightly arcuately bent in upper part, racemosely branched, whitish- or pinkish-green, roundish with occasional, appressed, yellowish hairs, with small lanceolate bracts, up to 0.5–0.9 cm long and 0.2–0.3 cm wide. Capitula 2 cm wide; involucre almost three-rowed, loosely imbricate. Involucral bracts 5 mm long, outer bracts almost half as long as inner ones, straw-yellow with much darker midrib, dark purple, obtuse, apex and with occasional fine cilia along margin and somewhat pubescent on surface. Receptacle flat, pitted-alveolar, alveolae bordered by long acute-triangular scales. Peripheral florets bright violet with two apical teeth, two times as long as disk florets; pappus yellowish with distinct barbs; achenes flat, appressed pilose. Flowering VIII–IX.

In shrub thickets. —*Far East*: Zeya-Bureya. Endemic. Described from the Bureya Range (left bank of the Bureya River). Type in Leningrad.

20. **A. pensauensis** Tamamsch. in Addenda XXIV, 580. —*A. lautureanus* auct. non Franch. and Sav. —*A. trinervius* auct. non Roxb. —*A. ageratoides* auct., non Turcz.

Perennial. Stem strongly branched above, pinkish-white, sometimes somewhat greenish, slightly bent, finely sulcate, more or less weakly angular, almost up to tip glabrous. Basal leaves absent; middle cauline leaves 10 cm long, 3 cm wide, lanceolate, shallowly and unevenly toothed, scabrous, like upper leaves acuminate with triangular apex, more or less coriaceous; leaves on branches, ever on lowermost, much smaller than upper cauline leaves, almost entire, lanceolate, scabrous due to very fine, short, stiff hairs, much brighter and with prominent midrib beneath, cuspidate, rather dense below inflorescence; leaves highly reduced in inflorescence, not toothed and slightly curved, scabrous, sessile like leaves on main axis, with prominent midrib. Capitula in compound lax corymb; second and third orders peduncles 2–3 cm long, basally with small bracteal leaf, straight, white. Involucral bracts two- or three-rowed, 1.0–2.5 mm long, becoming smaller above, slightly colored; inner bracts much longer, linear, almost two to three times as long as outermost. Receptacle almost flat or slightly convex, punctate-alveolate, edges around alveolae toothed membranous. Ray florets bright
103 lilac or almost white. Achenes flat, densely pilose; pappus setaceous, distinctly toothed. Flowering IX.

Shrub thickets, edges of coastal mixed forests. —*Far East*: Ussuri (south). Endemic. Described from the Spassk Region. Type in Leningrad.

Note. With its strongly branched stem and almost entire leaves this species resembles *A. ageratoides* var. *holophyllus* Maxim., described from Loshan Mountain of Khebei province. However, it is well distinguished by the form and texture of both the cauline leaves and the leaves in the inflorescence, as well as by the nature of inflorescence.

Series 3. Sutschanenses Tamamsch. —Leaves strongly attenuate, acuminate, basally narrowed, sometimes almost cuneate, coarsely and sharply serrate-toothed. Capitula on slender, almost glabrous, slightly curved peduncles. Involucral bracts linear. So far, this monotypic series represents a connecting link between sections *Amellus* and *Ageraton*.

21. **A. sutschanensis** Kom. in Bot. Mat. Gerb. Bot. Sada, VI, 1 (1926) 14.

Perennial. Rhizome creeping, horizontal. Stem hard, erect, simple, finely sulcate, in upper portion weakly angular, glabrous, 50–110 cm high, uniformly densely leafy. Leaves short-petiolate, large, including petiole 12–15 cm long, 2–4 cm wide, lanceolate, awned, sometimes subentire but most often sharply and coarsely toothed, much darker beneath, glabrous, with straight or crisped hairs along margin. Inflorescence consisting of numerous slender, unequal peduncles, more or less compressed below; peduncles of second order very slender, weakly curved, with single capitulum, 1.0–1.5 cm wide (excluding ligulate florets); apical leaves reduced at base of bifurcation of peduncle, lanceolate or linearly lanceolate, entire. Involucre campanulate; involucral bracts two- or three-rowed, loosely imbricate, green, linear, unequal; outer bracts considerably shorter than inner, scabrous due to pubescence, along veins and at apex purple, 3–6 mm long, finely ciliate along margin, narrowly cartilaginous. Disk florets bisexual, yellow, with tubular-infundibuliform corolla and somewhat unequal teeth; peripheral florets pistillate, with white, very narrow ligules, two times as long as involucral bracts. Achenes dorsally flattened, densely appressed-pubescent; pappus white or slightly yellowish, one- or two-rowed, of somewhat unequal, scabrous, serrate hairs. Flowering VII (Plate VII, Fig. 1).

Meadows with tall herbaceous vegetation, scrubs. —*Far East*: Ussuri (south). Endemic. Described from the bank of Suchan River. Type in Leningrad.

Note. This interesting species stands somewhat by itself in section
104 *Ageraton*. In general habit and outline of the leaves it somewhat resembles *A. glehnii* Fr. Schm. and seemingly occupies an intermediate position between it and *A. ageratoides*; however, it differs from the former by the shape of involucre, the involucral bracts, and other characters, permitting us to include it in section *Ageraton*.

Section 4. ALPINASTER Tamamsch. sectio nova. —*Alpigeni* Nees, Gen. *Aster* (1833) 24 p. m. p.; Ldb. Fl. Ross. II, 472, p. p.; Benth and Hook. Gen. pl. II, 272, p. p.; Onno in Bibl. Bot. H. 106 (1932) 6, p. p. —*Oritrophium* Torr. and Gray, Fl. Am. II (1841) 154, p. p. —Stem (peduncle) simple, solitary or few, usually pubescent, less often glabrous. Lower leaves lanceolate or spatulate; upper and middle leaves lanceolate, entire; all leaves with one or three distinct veins. Involucral bracts herbaceous, green, sometimes colored at tip, more or less obtuse, never imbricate, densely or not densely pubescent, with short or more or less long, sparse or appressed hairs. Pappus simple, white as long as disk florets or somewhat longer, pappus bristles almost equal. Achenes obovate, flat.

This section even in its narrowest interpretation, as presented here, is a connecting link to the genus *Erigeron* through section *Erigerastrum* Gray. Great differences of opinion have long existed among taxonomists about the boundary between the genera *Aster* and *Erigeron*. Such authorities in synantherology as Cronquist (1943, 1947, 1955), do not always appear consistent in their opinions regarding the limits of the genera *Aster* and *Erigeron*. For example, Cronquist transferred *Aster peregrinus* Pursh to the genus *Erigeron*, but retained *A. salsuginosus* Greene in the genus *Aster*, although he himself had pointed out the close affinity of these two species. Harling (1944), having studied both living plants and herbarium specimens of *A. peregrinus* Pursh, came to the conclusion that this species should be placed in section *Alpigeni* of *Aster*. Some of the species of the genus *Erigeron*, quite arbitrarily transferred from the genus *Aster*, should be considered for treatment as a separate genus. The character that often is given as one of the basic ones for distinguishing these two genera — one, two, or more whorls of ligulate florets—does not hold up strictly in the genus *Aster*; in fact, the ligules are not arranged in a whorl, but a spiral, and one end of the spiral often leads into another (particularly in species of section *Alpigeni*), such that one-and-one-half (and even two) turns of the spiral are formed, i.e. one-and-one-half whorls, as is usually said. Given the common appearance among the members of section *Alpigeni* of often very narrow ligules, not generally restricted to the genus *Aster*, and of numerous pappus bristles (true *Erigeron* has fewer) *A. peregrinus* and *A. salsuginosus* are closer to the genus *Aster* than to the genus *Erigeron* with respect to these characters. This is confirmed by embryological data as well: these species of the genus *Aster*, which have been transferred to the genus *Erigeron* by some taxonomists, show characters (monospermic development of endosperm) peculiar to *Aster* but not to *Erigeron*.

105 One more character motivated Cronquist to separate the genera *Aster* and *Erigeron*.— the late flowering of the former and early flowering of the latter. However, the members of section *Alpigeni* (s. l.) flower early; in the herbarium there are specimens collected in the flowering stage in the middle of May, and not a single specimen was found that was flowering in September, which is even customarily known as the month of asters.

In his treatise on the alpine asters and their closest relatives, Onno comes to the conclusion that the differences of opinion among taxonomists concerning the genera *Erigeron* and *Aster* will end only when both the genera are united into one. Although, he writes, one can find differences between these genera on the basis of European material, it is impossible to distinguish one from the other in Asia and America. All boundaries seem to be artificial and, in fact, are not found in nature. One cannot disagree with Onno's view; however, it does not follow from this that it is necessary to unite them all together. In contrast to phylogeny, the role of taxonomy is to break down the entire diversity of plant forms in order to make it comprehensible, and this is just most easily attained by dividing these forms into small groups, especially in such families as the Compositae, which are at the stage of evolving new forms all the time.

In fact, the section *Alpigeni*, in the sense of earlier authors, and section *Erigerastrum* of the genus *Erigeron* should be treated as two separate genera or else as one genus with two sections, which in the works by Onno (op. cit.) figure in rank as subsections—*Homochaeta* and *Heterochaeta*.

Thus, for the time being our section *Alpinaster* is provisionally included in the genus *Aster*, because this problem still requires special study.

22. **A. alpinus** L. Sp. pl. (1753) 872; M.B. Fl. taur.-cauc. 3, 571; DC. Prodr. V, 227; Ldb. Fl. Ross. II, 472, p. p.; Boiss. Fl. or. III, 157; Onno in Bibl. Bot. H. 106 (1932) 241 p. m. p. Grossh. Fl. Kavk. IV, 93; Vizn. Rosl. URSR (1950) 523. —*A. alpinus* var. *nivalis* DC. l. c.; Grossh. op. cit. —*A. alpinus* ssp. *dolomiticus* Onno (l. c.) p. m. p. — *A. alpinus* v. *calcareus* Kem.-Nat. in Tr. Tifl. Bot. Sada I (1934) 92; Grossh. op. cit. —*A. alpinus* var. *acutisquameus* Kem.-Nat. (op. cit.); Grossh. op. cit. —**Ic.**: Hegi, Ill. Fl. Mitt.—Eur. VI, 1, 426; Onno, op. cit. Taf. IA, No. 1.

Perennial. Rhizome up to 1 cm thick. Stems many or solitary, ascending, simple, usually 15 cm high, less often taller or shorter, one-headed, entirely covered with white, erect or more or less appressed, equal hairs, about 0.5 mm long. Basal leaves oblong, more or less spatulate, entire, narrowed into petiole, obtuse, usually three-veined; 106 upper leaves sessile, oblong, 0.5–3.0 cm long, obtuse, like middle and lower leaves, entire, bright green, on both sides uniformly and more or less strongly or weakly pubescent with simple many-celled hairs. Capitula solitary, large, 3–5 cm wide. Involucre hemispherical; involucral bracts lanceolate, almost equal, along margin very narrowly membranous, pubescent, less often almost glabrous, ventrally and sometimes even along margin (less often entirely) reddish, appressed, almost equaling disk florets, sometimes more or less acuminate. Receptacle somewhat convex, smooth, glabrous, with weak scars of achenes. Disk florets tubular, yellow; ligulate florets long, violet, pinkish or lilac, 12–15 cm long, 3–5 mm wide, often in many whorls. Achenes more or less flat, obovoid, almost cuneate at base, weakly or more or less strongly pubescent, up to 1.5 mm long, 1.0–1.5 mm wide above; pappus two times as long as achene, white, of almost equal bristles. Flowering VII–VIII.

Alpine altitudes, on rocks, in pastures on calcareous alpine slopes. —*European Part*: Trans-Volga Region (south Urals); Upper Dniester; *Caucasus*: Ciscaucasia, Dagestan, western, eastern and southern Transcaucasia; *Western Siberia*: Upper Tobol. *General distribution*:

Central Europe, Western Mediterranean, Balkans-Asia Minor. Described from the Alps. Type in London.

Note. According to the data of Onno, *A. alpinus* was described from a single specimen collected by one, Haller, in the Vallian Alps. The brief Linnaean description was later expanded somewhat by various taxonomists; in 1914 Guyot saw the Linnaean type of this species and described it as follows: "Plant approximately 15 cm tall, uniformly covered with whitish often 1/2 mm long hairs. Stem with entire leaves, of which lower oblong, obtuse, indistinctly narrowed into petiole; involucral bracts oblong, lanceolate, slightly scarious along border; ligules violet; achene weakly pubescent, with whitish pappus".

The wide range of variation in this species has stimulated the creation of the numerous subspecies, varieties, forms, races, and variants described in various floras and taxonomic reviews. Almost all of them brought together in Onno's monograph devoted to *Aster alpinus* and related forms. However, in his interpretation, *A. alpinus* seems to us to be an artificial taxon, because it includes geographically well isolated races, which should be evaluated as separate species. One can hardly agree with this author that on the basis of the nature of pubescence alone, plants from North America, Siberia and even Soviet Central Asia and the Caucasus be united in subsp. *Vierhapperi*. Hulten (1950), a researcher of the flora of Alaska and the Yukon and the flora of Kamchatka, also recognizes *A. alpinus* in the broad sense, but he too states that the subspecies *Vierhapperi* Onno, uniting elements from the above-named regions, can be accepted only provisionally.

107 Porsild (1948), author researcher from North America, expressed the opinion that it makes sense to differentiate the American and European species, because they differ from each other by a whole series of characters. This viewpoint seems right to us, and we consider it improper to identify, as done by Onno, for example, species from the Balkan Peninsula, described by Boissier and Orphanidez initially as *A. alpinus* var. *cylleneus* and later by Boissier and Huet as var. *armenus* and finally by Halacsy (1901) as *A. cylleneus*, with species from the European Alps and also with Mediterranean species. It also hardly makes sense to unite Caucasian races with elements of the flora of northern Europe or the Asiatic part of the USSR, especially given that, both in general habit and in a number of morphological characters, they differ markedly from each other.

Evidently, *A. alpinus* L. crosses with *A. amellus* L. Similar hybrid forms were observed in central European materials by Burgen, which are mentioned by Kerner, Hegi and Thellung. In the herbarium of the Academy of Sciences there are specimens from eastern Siberia, evidently also of hybrid origin, with intermediate characters. They were cited by Novopokrovsky in the description of the peculiar species with the epithet "monanthos." These specimens have one capitulum (*A. amellus* has several capitula) and receptacles typical of section *Alpigenia* (of earlier authors), but the involucral bracts are imbricate, and their shape is similar to those of *A. amellus* L. However, we presume that these intermediate forms are the result of crossing *A. amellus*, not with *A. alpinus*, but with *A. korshinskyi*, i.e., with the species separated by me from *A. alpinus* and the characteristic one of the European Part of the USSR and some regions of Siberia.

Apart from similar hybrid forms, certain types of anomalies are also found within *A. alpinus* L., of which the most common are forms with branched peduncles; in the herbarium they are usually labelled as var. *polycephalus* (auct. europ.) or var. *pleiocephalus* (De Candolle, Kemularia-Nathadze). Similar anomalies are found in other species of section *Alpinaster* from various localities. As regards the form, which Onno refers to also as a development teratological in nature, namely, forms with ligules that are shortened or absent, the latter, judging from the herbarium material, does not give the impression of an anomaly, and it has its own geographic area that was noticed by Turczaninow in his time and caused De Candolle to establish a new species, which we cite below.

23. **A. tolmatschevii** Tamamsch. nom. nov. —*A. chryzocomoides* DC. Prodr. VII (1838) 272, non Desf. (1815); Turcz. in Bull. Soc. Nat. Mosc. XIX, No. 2 (1846) 143; Ldb. Fl. Ross. II, 473. —*A. alpinus* f. *discoideus* auct. fl. sib. —*A. alpinus* var. *brachyglossus* Onno in Bibl. Bot. H. 106 (1932) 38, non DC. (1836).

Perennial. Plant 6–15 cm high. Stem solitary, slender, reddish, weakly
108 pubescent with appressed hairs. Lower leaves long-petiolate, lanceolate and narrowly lanceolate, entire, short appressed, weakly pubescent, with much longer hairs along margin, with three prominent veins beneath; upper leaves sessile, narrowly linear, one-veined, 2–3 cm long, 0.5–0.6 cm wide. Capitula solitary, hemispherical, 1.5 cm wide. Involucral bracts two-rowed, narrow, on both sides pubescent; inner bracts as long as outer, almost equaling florets. Florets sometimes only tubular; ligules as long as involucral bracts, much shorter or less often longer than involucral bracts (var. *radiatus* Trautv.). Pappus of dull white bristles as long as corolla. Flowering VIII.

Subalpine slopes, rubbly, calcareous talus. *Arctic*: Chukotka, Anadyr; *Western Siberia*: Irtysh, Altai; *Eastern Siberia*: Yenisei, Lena-Kolyma, Angara-Sayans, Dauria; *Soviet Central Asia*: Pamiro-Alai, Tien Shan. *General distribution*: Possibly found in Mongolia. Described from eastern Siberia (Norin-Khoroi). Type in Leningrad.

24. **A. serpentimontanus** Tamamsch. non. n. —*A. cylleneus* Onno in Bibl. Bot. H. 106 (1932) 39 p. p., non Halaczy (1901). —*A. alpinus* var. *cylleneus* Onno, ibid non Boiss. —*A. alpinus* auct. fl. Sib. non L.; Krylov, Fl. Zap. Sib. XI (1849) 2661.

Perennial. Rhizome branched, forming turf, up to 1.2 cm thick, covered with long, slender, adventitious roots. Stems usually densely and spreadingly pubescent, 8–10 cm high. Basal leaves crowded, erect, on very slender, long petioles, oblanceolate, including petiole 3–5 cm long, 0.5–1.0 cm wide; upper leaves gradually reduced, sessile, narrow or absolutely linear, below capitula almost subulate, like middle and lower leaves bright green and brownish due to dense pubescence of short appressed and straight hairs and very fine glandular hairs, almost fimbriate because of longer hairs, with distinct midrib beneath. Capitula solitary on stems, rather large, including ligulate florets 3.5–4.0 cm wide. Involucre hemispherical. Receptacle glabrous, more or less convex; involucral bracts bright green, brownish due to pubescence, with inconspicuous membranous margin, ciliate, apically colored, dorsally covered with long hairs, almost as long as disk florets. Corolla of disk florets yellow; ligules bright pinkish, slightly violet, two times as long as involucral bracts. Achenes obovoid, weakly pubescent; pappus white; pappus hairs two times as long as achene, equaling disk florets. Flowering V–VIII.

Stony slopes, exposed rocks, rubbly hillocks and river banks. — *Arctic*: Anadyr; *Western Siberia*: Irtysh (south), Altai; *Eastern Siberia*: 109 Angara-Sayans, Dauria; *Far East*: Kamchatka; *Soviet Central Asia*: Balkhash Region (south); Pamiro-Alai, Tien Shan. *General distribution*: Dzhungaria-Kashgaria. Described from the vicinity of Zmeinogorsk. Type in Leningrad.

25. **A. korshinskyi** Tamamsch. sp. n. in Addenda XXIV, 578. — *A. alpinus* var. *dahuricus* Lindl. in Onno, Bibl. Bot. H. 106 (1932) 47. —*A. alpinus* ssp. *vierhapperi* Onno, ibid, p. m. p.

Perennial. Rhizome ascending, branched, densely covered above with dried leaves. Stems including capitulum 20–36 cm high, strong, ascending or more or less erect, solitary or many, weakly angular, finely sulcate, more densely pubescent below and below capitulum, more or less divergent, fine, grayish, unequal hairs. Lower leaves crowded at base, large, including petiole up to 12 cm long, somewhat horizontal or divergent, but never directed upward as in previous species; petiole almost as long as or somewhat shorter than lamina, narrowly winged at base of stem, ciliate; lamina 2–7 cm long, 1.5–2.0 cm wide, weakly pubescent, besides unequal cilia along margin, covered with very short appressed hairs, usually almost rotund in lowermost leaves, in other leaves elliptical with three to five, prominent veins beneath; middle leaves reduced, usually lanceolate, less often linear, sessile, more strongly pubescent. Capitula large, including ligulate florets up to 4.5–5.0 cm wide. Involucre hemispherical, sometimes reniform on drying; involucral bracts green, herbaceous, almost uniform; inner bracts acuminate, 1 cm long, 2 mm wide, weakly pubescent along margin, long ciliate particularly in lower portion, slightly shorter than disk florets, with yellow tubular corolla; ligules bright pinkish-lilac, four-veined, 1.8–2.2 cm long, 3–4 mm wide, several times as long as pappus; pappus bristles white, not numerous, unequal, longest almost as long as or slightly longer than disk florets. Achene almost three times as long as pappus, obovoid, compressed, brownish, weakly pubescent with upright, appressed hairs. Flowering VII. (Plate VIII, Fig. 1).

Steppes, open calcareous slopes of middle montane zone, in light forest. —*European Part*: Volga-Kama, Dvina, Pechora; *Western Siberia*: Upper Tobol, Ob Region; *Eastern Siberia*: Lena-Kolyma (southwestern part). Endemic. Described from Krasnoufimsk. Type in Leningrad.

Note. A. scapigerum Ldb. Fl. Ross. II, 472, described from the Baraba steppe, remains a mystery and only hypothetically can be identified with *A. korshinskyi* Tamamsch.

26. **A. fallax** Tamamsch. sp. nova in Addenda XXIV, 580. —*A. flaccidus* f. *atropurpureus* Onno in Bibl. Bot. H. 106 (1932) 65.

Perennial. Rhizome long creeping, with slender roots. Stems 30 cm 110 long, woolly, particularly strongly in upper part below capitulum, purple or brownish-purple, more or less terete, rather deeply and uniformly sulcate, almost always straight or slightly bent at base, solitary, or two or three. Basal leaves crowded in prostrate or ascending rosette, undivided, obtuse, spatulate, or lanceolate, green or purple, with prominent midrib beneath, usually with abruptly narrowed petiole, as long or almost as long as lamina, on both sides glabrous or with occasional and very fine glandular hairs, ciliate; cauline leaves lanceolate, sessile, lower horizontal, uppermost acuminate, reduced, like *A. alpinus*. Capitula larger than *A. alpinus*, similar to previous species. Involucre hemispherical; involucral bracts lanceolate, herbaceous or along margin narrow membranous, up to 1 cm long, 2–3 mm wide, purple, outer as well as innermost bracts densely pubescent dorsally along midrib and margin with rather long flexuous hairs, sometimes particularly dense at tip; inner bracts dorsally glabrous, pubescent only along margin; both inner and outer bracts usually without glandular hairs, three- to five-veined;

densely anatomizing. Corolla of disk and ligulate florets almost glabrous or on inner side with very fine and occasional glandular hairs; disk florets yellow, bisexual, appendages of style branches oblong-spatulate, densely pubescent outside; ligules purple-violet (when dry), 2.0–2.5 cm long, with four veins and one or two or three teeth; appendages of stigma branches of ligulate florets glabrous outside, narrow, obtuse. Achene obovoid-cuneate, sharply narrowed below, compressed, brown, weakly pubescent; pappus one-rowed, of unequal, yellowish or rust-coloured hairs, longest hairs slightly longer than achene and one-fourth as long as ligules. Flowering VII.

Alluvial deposits on slopes of ridges, on calcareous soils. —*Eastern Siberia*: Angara-Sayans (south), Dauria. *General distribution*: Mongolia, China, the Indo-Himalayas. Described from the Sayan Range. Type in Leningrad.

GENUS 1463 **Kemulariella** Tamamsch. [1, 2]

Tamamschjan in Addenda XXIV, 580. —*Calimeris* DC. Prodr. V (1836) 259 p. p. —*Diplopappus* DC. ibid. 275 p. p. Ldb. Fl. Ross. II (1844–1846) 484 p. p. —*Aster* Sect. *Calimeris* Benth. and Hook. Gen. II (1873) 274 p. p.; Hoffm. in Pflanzenfam. IV, 5 (1894) 162 p. p. —*Aster* Sect. *Caucasica* Kem.-Nat. Tr. Tifl. Bot. Inst. I (1934) 98

Capitula medium or large, heterogamous, heterochromous, usually 111 solitary terminal. Involucral bracts loosely imbricate, acute, herbaceous, somewhat like bracts in *Erigeron*, without appendage. Receptacle convex, conical, or hemispherical, alveolate, narrowly membranous along edges of alveolae. Disk florets bisexual with yellow, tubular corolla; peripheral florets pistillate, one to one-and-one-half-whorled, ligulate, numerous, with purple, pink, bright pink or almost pink corolla; ligules somewhat longer than pappus. Anthers obtuse at base with long, lanceolate appendage. Style branches with wide, triangularly lanceolate or lanceolate appendage in bisexual florets and narrower and less acute, sometimes oval appendage in pistillate florets. Achene oblong, not or slightly compressed dorsally, more or less angular, with three fine ribs, densely pubescent with stiff appressed hairs. Pappus two-rowed, outer row of short scales, less often of short flat bristles; inner row of equal or slightly unequal, long, thin, finely toothed bristles. Perennial herbs, sometimes more or less semishrubs, with strongly woody nodular

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[1] Treatment by S.G. Tamamschjan.

[2] Named after L.M. Kemularia-Nathadze, a researcher of the Caucasian flora and specialist in the Caucasian asters.

rhizome, producing solitary or many stems, with entire or somewhat toothed, sessile, leaves.

An endemic Caucasian genus so far consisting of six species in two sections.

The genus *Kemulariella* is distinguished from *Aster* by the two-rowed pappus, shape of achene, and receptacle. In the structure of pappus, this genus is closer to the American genus *Diplostephium* and to *Diplopappus*; although the taxonomic significance of this is not yet clear, all the same it is recognized by some authors of the modern African flora. The solitary, large capitulum of *K. caucasica* also resembles certain African members of *Diplopappus*, which, according to De Candolle, is definitely heterogenous. In receptacular structure, this genus is somewhat similar to *Boltonia* and *Kalimeris*; De Candolle vainly included *Aster roseus* (i.e., *K. rosea*) under *Calimeris*. The latter has an altogether different shape of achene than *Kemulariella* and instead of pappus it has distinct bristles or they are entirely absent.

1. Stem up to 50–60 cm high, herbaceous, usually with single peduncle (less often, peduncles many) bearing large capitulum, 3–5 cm wide, with purple or dark pink ligulate florets, two times as long as tubular disk florets..1. **K. caucasica** (Willd.) Tamamsch.

+ Stems many, slender, woody below, plant with appearance of semishrubs; capitula 1.0–3.5 cm wide, with pink, pale pink, or almost white ligulate florets..2

2. Capitula 2.0–3.5 cm wide, pink ligulate florets; outer row of pappus consisting of numerous thin, unequally short, more or less flat bristles..............................2. **K. rosea** (Stev.) Tamamsch.

112 + Capitula 1.0–1.7 (2.0) cm wide; ligulate florets bright pink or almost white; outer row of pappus consisting of uniformly short, scaly, flat bristles..3

3. Leaves linear, short; capitula 1.0–1.7 cm wide; involucre narrow, glabrous. Plants very small...3. **K. abschasica** (Kem.-Nat.) Tamamsch.

+ Leaves lanceolate, oblong-lanceolate, or elliptical; capitula much larger than in previous species..4

4. Leaves lanceolate or oblong-lanceolate, sessile, entire, acuminate; ligulate florets pink or pinkish...4. **K. tugana** (Alb.) Tamamsch.

+ Leaves broadly lanceolate or elliptical, short-petiolate or narrowed towards base; ligulate florets almost white..........................5

5. Leaves elliptical, almost entire, very short-petiolate; involucral

bracts and peduncles densely pubescent; ligulate florets almost white...5. **K. albovii** Tamamsch.

+ Leaves broadly lanceolate with occasional glandular, toothed hairs usually along margin above middle of lamina; involucral bracts glabrous; ligulate florets pink...6 **K. colchica** (Alb.) Tamamsch.

Section 1. CAUCASICA Kem.-Nat. p. p. in Tr. Tifl. Bot. Inst. I (1934) 98. —Capitula large, solitary; receptacle convex, hemispherical; achenes large, two-rowed pappus distinctly visible to naked eyes. Herbaceous plant with solitary stem.

1. **K. caucasica** (Willd.) Tamamsch. comb. nova. —*Aster caucasicus* Willd. Sp. pl. III (1800) 2020; M.B. Fl. taur.-cauc. II, 310; Boiss. Fl. or. III, 160; Lipsky, Fl. Kavk. 341; Medvedev, Vysokog. Rast. Kavk. 244; Kem.-Nat. ibid., 98; Grossh. Opredel. 440. —*Diplopappus caucasicus* DC. Prodr. V (1836) 277; Ldb. Fl. Ross. II (1844) 485. —*Aster monocephalus* Boiss. and Bal. ex Boiss. Fl. or. III (1875) 160. —*Aster psyschensis* Kem.-Nat. in Tr. Tifl. Bot. Inst. I (1934) 102.

Perennial. Rhizome woody, nodulose; stem simple, up to 50–60 cm high, more or less ribbed, covered with long articulate hairs, densely leafy. Leaves 5–9 cm long, 2.5–4.0 cm wide, sessile with roundish, almost amplexicaul, somewhat auriculate base; lower cauline leaves sparsely serrate, broadly lanceolate, or ovate, acuminate, very large (9 cm long), almost undivided or with scarcely visible teeth (f. *brittatica* 115 m. from Brittatskoe Ravine); middle and upper leaves smaller; all leaves basally with distinct veins, covered with long, more or less crisped hairs. Capitula 3.0–4.5(5) cm wide, solitary or few (var. *pleiocephala* Boiss.), terminal on thick peduncles. Involucre broadly hemispherical with loosely arranged, more or less imbricate, linearly lanceolate, herbaceous bracts, subobtuse, covered with articulate hairs or small papillae; outer and inner bracts almost equal or outer bracts slightly shorter than inner. Disk florets yellow, tubular; ligulate florets pink or purple with violet tinge. Appendages of style branches of disk florets broadly triangular or broadly lanceolate, in pistillate florets narrower, less pubescent from outer side than in disk florets. Achene long, not flat, compressed laterally, triangularly ribbed, covered with appressed stiff hairs. Pappus of long, inner, stiff hairs and very short, outer, whitish, scaly hairs. Flowering VII–IX. (Plate VI, Fig. 3).

Subalpine and alpine meadows. —*Caucasus*: Ciscaucasia, western Transcaucasia. Endemic. Described from the Glavny [Main] Caucasus Range. Cotype in Leningrad.

Note. Boissier cites this species for Lazistan. Kemularia-Nathadze reports five* more varieties, apart from var. *pleiocephala* Boiss., for the flora of Georgia: var. *alpestris* Kem.-Nat., var. *ovalifolia* Kem.-Nat., var. *angustifolia* Kem.-Nat. and var. *canescens* Kem.-Nat.

Section 2. THAMNOASTER Tamamsch. sectia nova. —Perennial plants with small semishrub habit and woody branches; capitula many, smaller, usually solitary on each leafy peduncle.

2. **K. rosea** (Stev.) Tamamsch. comb. nova. —*Aster roseus* Stev. in Mém. Soc. Nat. Mosc. III (1812) 245 nom. nud.; M.B. Fl. taur.-cauc. suppl. (1819) 571; Boiss. Fl. or. III, 159; Lipsky, Fl. Kavk. 341; Medvedev, Vysokog. Rast. Kavk. 245; Kem.-Nat. ibid., 105; Grossh. Opredel. 440. —*Calimeris rosea* DC. Prodr. V. (1836) 259.

Perennial. Rhizome nodular, thick. Stems numerous, slender, crowded, glabrous or somewhat pubescent above, up to 40 cm high. Leaves sessile, narrow, long, linear or linearly sabre-shaped, 1.5–5.0 cm long, 0.1–0.3 cm wide, acute, entire, one-veined. Peduncles slender, terete, somewhat pubescent, sometimes axillary, with reduced apical leaves, bearing solitary capitula. Capitulum medium, 2.0–3.5 cm wide. Involucre 7–12 mm wide, 6–8 mm long; bracts unequal, two- or three-rowed, more or less imbricate, narrowly lanceolate, along margin membranous and ciliate; ventrally glabrous, sometimes tomentose. Disk flo-116 rets bisexual, with yellow, tubular corolla; ligulate florets pistillate, pink, two times as long as disk florets; appendages of style branches lameolate, much larger and broader in bisexual florets. Achene oblong, somewhat compressed, more or less angular, with three filiform ribs, rather densely hairy. Pappus of two-rowed, pinkish, thin, unequal, short bristles. Flowering VI–VIII.

Alpine and subalpine calcareous soils. —*Caucasus*: Dagestan, eastern Transcaucasia. Endemic. Described from Shakh-Dag Mountain. Type in Helsinki; cotype in Leningrad.

3. **K. abchasica** (Kem.-Nat.) Tamamsch. comb. nova. —*Aster abchasicus* Kem.-Nat. in Tr. Tifl. Bot. Inst. I (1934) 104; Ej. Fl. Gruzii, VIII (1952) 229. —*A. roseus* auct. fl. Cauc., non Stev.

Perennial. Small glabrous plant. Root woody, branched. Stems slender, numerous, terete, simple. Leaves small, linear, 1–3 cm long, 0.1–0.2 cm wide, rather dense. Peduncles rather slender, long, with solitary capitula. Capitulum 1.0–1.7 cm wide. Involucral bracts two- or three-

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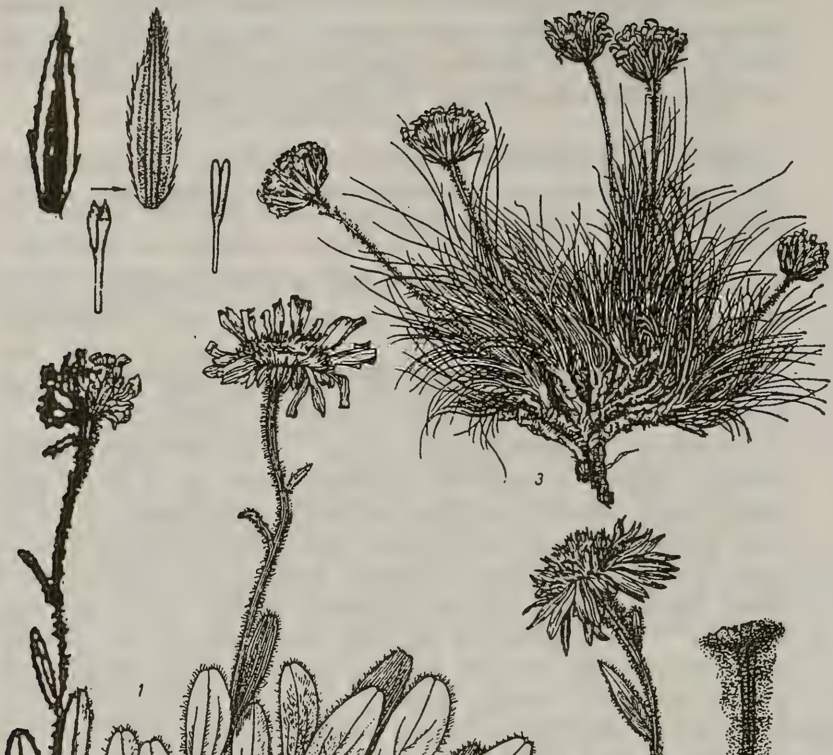
*Only four varieties are listed in the original—General Editor.

116



113 Plate VIII.
1—*Aster korshinskyi* Tamamsch., habit; 2—*A. fallax* Tamamsch., habit, pubescence of peduncle; 3—*Arctogeron graminifolium* DC., habit, involucral bract, style of bisexual floret (left), style of ligulate, pistillate, floret (right).

rowed, unequal, linearly lanceolate, acuminate, along margin more or less membranous, glabrous. Disk florets bisexual, tubular, with yellow corolla; peripheral florets pistillate, with pinkish or pinkish-white ligules, larger than disk florets, but equaling involucral bracts or slightly longer; appendages of style branches narrow triangular-lanceolate, much broader in bisexual florets than in pistillate florets. Achene densely pubescent, oblong, slightly angular, with three (sometimes two) thin filiform ribs. Pappus 2-seriate; outer row of very short (considerably shorter than inner) membranous, flat hairs; inner row bristles long, stiff, slightly dentate. Flowering VI–VIII.

In subalpine zone, on calcareous soils. —*Caucasus*: Western Transcaucasia. Endemic. Described from Chkho Mountain in eastern Abkhazia. Type in Tbilisi; cotype in Leningrad.

Note. Close to *K. rosea*, but well distinguished by the structure of the pappus and the characteristics of the leaves.

4. **K. tugana** (Alb.) Tamamsch. comb. nova. —*A. tuganus* Alb. in Bull. de l'Herb. Boiss. II, 4 (1894) 253; Lipsky, Fl. Kavk. 341; Medvedev, Vyskog. Rast. Kavk. 245; Kem.-Nat. in Tr. Tifl. Bot. Inst. I (1934) 103. —*Aster tuganus* Alb. Prodr. Fl. Colch. (1895) 129; Radde, Mus. Cauc. (1901) 105, —**Ic.**: Kolak. Fl. Abkh. IV, 201, Plate XX.

Perennial. Small plant with woody rhizome. Stems numerous, appressed slender, erect or ascending, reddish, covered with hooked hairs. Cauline leaves rather numerous, 3–4 cm long, 1.0–1.5 cm wide, oblong-lanceolate, sometimes oblong rhombically lanceolate, entire, sessile; 117 lamina with prominent midrib, short-hairy along margin and veins (midrib and lateral veins). Peduncles cylindrical, thin below, slightly thickened and pubescent above, bearing one or two capitula. Capitulum medium, 2.0–2.5(3.0) cm wide. Involucre campanulate, two- or three-rowed; bracts imbricate, lanceolate, unequal, membranous along margin, acute and glandular-hairy or subglabrous; inner bracts longer than outer ones. Receptacle conical, almost glabrous; disk florets bisexual, tubular, yellow; peripheral florets pistillate with white and pink ligules. Achene oblong, somewhat triangular, with fine ribs, densely appressed pubescent with erect, stiff hairs. Pappus double; outer row of very short, whitish, membranous hairs; bristles of inner row much longer than outer one, almost equal, weakly toothed. Flowering VI–VIII. (Plate VI, Fig. 2).

In subalpine zone, calcareous slopes. —*Caucasus*: Western Transcaucasia. Endemic. Described from Abkhazia. Type in Geneva; cotype in Leningrad.

5. **K. albovii** Tamamsch. sp. n. in Addenda XXIV, 581. —*Aster colchicus* auct. non Alb.: Kem.-Nat. in Tr. Tifl. Bot. Inst. I (1934) p. p. and auct. caus.

Perennial. Small semishrub, 25–30 cm high. Rhizome horizontal, strongly woody. Stems numerous, slender, reddish, puberulent, rather densely leafy at small distance from stem base. Leaves 2.5–4.5 cm long, 1–2 cm wide, with broadly elliptical lamina, awned, very short-petiolate, thin, on both sides puberulent, darker above than beneath, with three distinct veins from base. Peduncles few, slender, covered with shorter hairs than on stem, bearing solitary, medium capitula. Involucre campanulate, with almost uniform bracts, two-rowed, pubescent like peduncles; inner bracts with narrow membranous margin. Disk florets bisexual, tubular, yellow; peripheral florets pistillate, ligulate with pale pink or whitish ligules, two times as long as involucral bracts. Achenes compressed laterally, more or less angular, scabrous. Pappus double. Flowering VII–VIII.

Ravines, in crevices of calcareous rocks. —*Caucasus*: Western Transcaucasia. Endemic. Described from Abkhazia. Type in Leningrad.

Note. This species is close to the following species described earlier by Albov. However, it is morphologically distinct, characterized by different habitat conditions.

6. **K. colchica** (Alb.) Tamamsch. comb. nova. —*Aster colchicus* Alb. in Bull. Herb. Boiss. III, 3 (1895) 89; Lipsky, Fl. Kavk. 341; Kem.-Nat. in Tr. Tifl. Bot. Inst. I (1934) 102, p. p.

Perennial. Plant 13–20 cm high. Rhizome vertical, nodulose, strongly
118 woody. Stems slender, numerous, almost cylindrical, reddish, intensely colored and rather densely leafy. Leaves oblong or broadly lanceolate, 2.0–3.5 cm long; lower leaves smaller and obtuse, with thin lamina, scabrous due to long, articulate hairs, particularly along margin, dark green, often turning black on drying, with few blackish glandular, toothed hairs along margin, usually in upper half of lamina, slightly narrowed at base. Peduncles with solitary capitula, slender, but slightly thickened and pubescent below capitulum. Involucre campanulate; bracts more or less equal, narrow, glabrous. Disk florets yellow, bisexual; peripheral florets pistillate, with pink ligules, longer than involucral bracts. Achenes more or less compressed, densely scarious. Pappus two-rowed; outer row of flat, membranous hairs; inner row bristles as long as or longer than inner involucral bracts. Flowering VII–VIII.

Limestones of the alpine and subalpine zone. —*Caucasus*: Western Transcaucasia. Endemic. Described from Abkhazia. Type in Leningrad.

Although there is a reference in the literature (Boissier) to the occurrence of *K. caucasica* in Lazistan, nevertheless, the genus *Kemulariella* may be considered as an endemic Caucasian genus. All species, particularly of section *Thamnoaster*, are Tertiary relicts as attested by their small, sharply restricted area of distribution and their confinement to limestones of western Transcaucasia, the refugium of several ancient species.

GENUS 1464. **Chamaegeron** Schrenk [1,2]

Schrenk in Bull. Phys.-math. Acad. Sc. Pétersb. III (1845) 107

Capitula with small number of florets of different sex. All florets fertile; peripheral florets pistillate, longer than pappus; in one row; ligules lilac, linear, two-toothed, spirally recurved after flowering; tube covered with short, scattered hairs; style branches filiform. Disk florets as long as pappus, pale yellow, bisexual, tubular, five-toothed, with scattered hairs in lower half; anthers at base without appendages; branches of style linearly lanceolate, acute. Pappus of all florets similar, uniseriate; pappus bristles equal, white, thin, finely toothed, connate into ring at base, detaching from achene at maturity together with ring. Achenes developing in all florets, bright, flat, bicostate, oblanceolate, pubescent with semi-appressed, short, scattered hairs. Receptacle flat, glabrous.

Annual plants of wet saline areas, covered with short-stalked capi-
119 tate glands mixed with longer, erect hairs in some species. Leaves and outer leafy involucral bracts acute and cartilaginous at apex.

The genus contains three species.

Type species: *C. oligocephalus* Schrenk.

1. Lower leaves obovate. Pubescence of short-stalked, capitate glands and longer, erect, many celled hairs. Ligule two times as long as corolla tube............................1. **C. bungei** (Boiss.) Botsch.

+ Lower leaves linear or linearly lanceolate. Pubescence only of short-stalked, capitate glands. Ligule more or less as long as corolla tube......................................2. **C. oligocephalus** Schrenk.

1. **C. bungei** (Boiss.) Botsch. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVI (1954) 383. —*Erigeron bungei* Boiss. Fl. Or. III (1875) 164; Popov in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, No. 7, 10.

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[1] Treatment by V.P. Botschantzev.

[2] From the Greek word: *Chamae* meaning "low", and the generic name *Erigeron*, because of dwarf habit and resemblance to *Erigeron* of the plants on which the description of this genus was based.

Annual. Stem 15–45 cm high, erect, from base divaricately branched four times, forming paniculate inflorescence of capitula, with scattered, erect, long, stiff, many-celled hairs and numerous short-stalked glandular hairs (in uppermost part of stem, pubescence of only short-stalked glandular hairs). Leaves green, 0.3–3.0 cm long and 0.5–10.0 mm wide, all terminating in short, cartilaginous, fragile, acute tip, covered with scattered, erect, long, stiff, many-celled hairs and large number of short-stalked glandular hairs (only uppermost leaves with exclusively short-stalked glands); lower leaves obovate, petiolate, obtuse, with few, small, acute teeth at apex; other leaves smaller, lanceolate, short-acuminate, entire, sessile. Capitulum about 0.6 cm long and 0.9 cm wide. Outer involucral bracts herbaceous, about 2.5 mm long and 1.0 mm wide, oblanceolate, with short, cartilaginous, fragile, acute tip, dorsally with numerous short-stalked glands; inner bracts about 4 mm long and 0.6 mm wide, not longer than pappus, oblanceolate, membranous along margin, fimbriate at apex, violet, dorsally with short-stalked glands. Peripheral florets one-whorled, about 4.5 mm long, ligulate; ligules about 3 mm long and 0.5 mm wide, lilac, linear, apically two-toothed, spirally recurved after flowering; tube with scattered short hairs. Disk florets bisexual, tubular, five-toothed (outer tooth shortest and separated from others by much deeper incision), pale yellow, about 3 mm long, scatteredly pubescent in lower part of tube. Pappus one-rowed. bristles 16–20, equal, 2.5–2.7 mm long, basally connate into ring, and all falling together with ring after maturity of achenes. Achenes developing in all florets, oblanceolate, flat, about 1.5 mm long, covered with short appressed hairs. Flowering VIII–X.

120 Gravel-beds in river valleys. —*Soviet Central Asia*: Mountainous Turkmenia (Kushka). *General distribution*: Iran region (Iran, Afghanistan). Described from Kerat-Kukh Mountain on the border of Afghanistan with Iran. Cotype in Leningrad.

2. **C. oligocephalus** Schrenk in Bull. phys.-math. Acad. Sc. Pétersb. III (1845) 107; O. and B. Fedtsch. Perech. Rast. Turk. IV, 167; Botschantzev in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVI, 383. —*Erigeron stocksianum* Boiss. Diagn. sér. 2, III (1856) 8; Fl. Or. III, 163; O. and B. Fedtsch. Perech. Rast. Turk. IV, 163; B. Fedtsch. Rast. Turk. 731; Pavlov, Fl. Tsentr. Kazakhst. III, 227; Popov in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, No. 7, 10. —*Aster lacunarum* Aitch. and Hemsley in Journ. Linn. Soc. XIX (1882) 168; Boiss. Fl. Or. suppl., 287; Rech. f. Symbolae Afghanicae II, 5. —*Erigeron oligocephalus* B. Fedtsch. Rast. Turk. (1915) 731; Popov in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, No. 7, 10. —**Ic.**: Journ. Linn. Soc. XIX, tab. 16.

Annual. Stem 2.5–3.5 cm high, erect, branching above or from base, dichasially branched up to fourth order and bearing paniculate inflorescence, inflorescence occasionally simple, single-headed, glabrous below, covered above with numerous short-stalked glands, leafy. Leaves green, 0.2–2.5 cm long and 0.5–5.0 mm wide, short-acuminate, terminating in short, cartilaginous, fragile tip; lowermost leaves oblanceolate, short-petiolate, entire or with few, small, acute teeth, glabrous; other leaves covered with short-stalked glands, smaller, sessile, linearly lanceolate. Capitula about 6 mm long and 10 mm wide. Outer involucral bracts about 2.5 mm long and 1 mm wide, herbaceous, oblanceolate, short-acuminate, terminating in cartilaginous, fragile tip, dorsally covered with numerous short-stalked glands; inner bracts about 6.0 mm long and 0.75 mm wide, oblanceolate, short-acuminate, along margin membranous, at tip ciliate and violet colored, dorsally with short-stalked glands, as long as pappus or slightly longer. Peripheral florets pistillate, one-whorled, ligulate, about 4 mm long, with tube entirely scatteredly pubescent; ligules lanceolate, two-toothed at tip, violet, about 2 mm long and 0.4 mm wide, spirally recurved after flowering; style branches filiform. Disk florets 2.6–3.5 mm long, pale yellow, bisexual, tubular, scatteredly pubescent in lower half, five-toothed; outer tooth separated from others by deep incision; style branches lanceolate. Pappus one-rowed, bristles 23–27, equal, about 3 mm long, connate at base into ring and shedding together with ring after maturity of achenes. Achenes developing in all florets, oblanceolate, flat, about 1.75 mm long, covered with short, scattered, semi-appressed hairs. Flowering VII–IX. (Plate XV, Fig. 2).

121 Wet, usually saline areas in river valleys, on banks of lakes. — *Soviet Central Asia*: Balkhash (Chu-Ili Mountains, Lake Biilyu-kul); mountainous Turkmenia (Kushka, Sulyuklyu). *General distribution*: Iran region (Afghanistan, Baluchistan). Described from Chu-Ili Mountains of Tien Shan. Type in Leningrad.

GENUS 1465. **Doellingeria** Nees [1, 2]

Nees Gen. et sp. Aster (1832) 177, p. p.; DC. Prodr. V (1836) 263. — *Biotia* Maxim. Prim. Fl. Amur. (1859) 146, non DC.; Rgl. Tent. Fl. Ussur. (1861) 83

Capitula heterogamous; ligulate florets pistillate, one-whorled; disk florets bisexual, five-toothed; corolla tube abruptly terminating into

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[1] Treatment by S.G. Tamamschjan.

[2] Named in honor of the 18th-century, Bavarian naturalist, Doellinger.

limb; receptacle flat, alveolate; involucre imbricate, of two, sometimes three, rows of herbaceous bracts; style appendages of disk florets obtuse, on outside scabrous. Achenes dark brown, cylindrical, somewhat angular with five ribs; pappus two-rowed; pappus hairs stiff, usually scabrous, some of them apically filamentous, others thick, slightly longer than achenes. Capitula in lax corymbose-cymose inflorescence. Perennial herbs with undivided leaves.

This genus is monotypic and found in East Asia.

1. **D. scabra** (Thunb.) Nees, Gen. et sp. Aster (1833) 183; DC. Prodr. V (1836) 263. —*Aster scaber* Thunb. Fl. Jap. (1784) 316; Fr. and Sav. Enum. Pl. Jap. I, 224; Hemsl. in Journ. Linn. Soc. XXIII, 415; Kom. Fl. Manchzh. III, 590; Nakai, Fl. Koreana II, 10; Kom. and Alis. Opredel. Rast. Dalnevost. Kr. II, 1010; Kitagawa, Index Fl. Gehol. 53; Kitamura, Comp. Jap. I (1937) 359. —*Aster komarovii* Lével. and Vaniot in Bull. Acad. Geogr. Bot. XX Mém. (1909) 142. —*Biotia discolor* Maxim. Prim. Fl. Amur. (1859) 146; Freyn in Öst. Bot. Zeit. (1902) 114. —*B. corymbosa* var. *discolor* Rgl. Tent. Fl. Uss. (1861) 83; Herder in Bull. Soc. Nat. Mosc. I (1865) 388. —**Ic.**: Kom. and Alis. op. cit., Plate 302.

Perennial. Rhizome short and thick. Stems 1.0–1.5 cm high, erect, stiff, sulcate, glabrous, paniculately branched and weakly pubescent above. Basal leaves long-petiolate, cordate; lower cauline leaves on still longer petioles, with or without wings, lamina large, 10–25 cm long and 6–18 cm wide, basally cordate, short-acuminate, toothed or double toothed, green above, brighter beneath, with dense, scabrous pubescence on both sides; upper leaves reduced, short-petiolate, oblanceolate, 122 below inflorescence linear. Capitula in lax cymose corymbs, pedunculate, 0.9–3.0 cm long, with or without somewhat pubescent bract, peduncle thickened below inflorescence. Involucre condensed, globose; involucral bracts remote, imbricate, three-rowed, dorsally green, rounded above, ciliate; outer bracts up to 1.5 cm long, inner 4–5 mm long. Corolla of ligulate florets white, with glabrous tube; disk florets hairy in upper part, slightly recurved. Receptacle alveolate, edges of alveolae somewhat raised, incised. Achene elongate, oblanceolate, slightly compressed above, more or less cylindrical, gradually narrowed downward, along edge with veins on surface, with one rib. Pappus dull white; bristles numerous, scaberulous, unequal, much longer in upper part, slightly thickened. Flowering VII–IX. (Plate III, Fig. 1).

Forests, forest edges, in shrubby undergrowth. —*Far East*: Zeya-Bureya, Uda River area, Ussurii. *General distribution*: Northern China, Japan, Korea. Described from Japan. Type in Uppsala.

GENUS 1466. **Kalimeris** Cass. [1,2]

Cass. in Dict. Sc. Nat. XXIV (1822) 324. —*Calimeris* Nees, Gen. et Sp. Ast. (1832) 225, p. p.; DC. Prodr. V (1836) 258, p. p.; Torrey and Gray, Fl. North Amer. II (1841–1843) 156.—*Aster* Sybsect. *Calimeris* in Pflzfam. IV, 5 (1894) 161. —*Hisutsua* DC. Prodr. VI (1837) 44. —*Boltonia* Benth. and Hook. f. Gen. Pl. II (1873) 169, p. p., non l'Hér. —*Martinia* Vaniot in Bull. Geogr. Bot. XII (1903) 31; XIII (1904) 16

Capitula heterogamous, medium, in lax corymbs. Ligulate florets pistillate, one- or two-whorled, pseudoligulate; disk florets bisexual, fertile like ligulate florets. Involucre semiglobose; involucral bracts two- or three-rowed, almost all equal, or outer slightly shorter and loosely imbricate, obtuse or acuminate, all herbaceous. Receptacle strongly conical, alveolate; alveolae undivided on edges or slightly fimbriate. Corolla of ray florets blue or white, of disk florets—yellow, five-toothed, tubular. Anthers at base obtuse; style branches lanceolate at ends. Achene compressed, obovoid or oblong, ribbed along edges, without ribs in upper and lower part or sometimes ribbed, with scabrous sparse hairs or glabrous. Pappus 0.25–1.0 mm long; bristles free at apex, not uniformly attenuate-acuminate, corinate below.

Perennial herbs with alternate, ovate coarsely toothed (sometimes almost pinnate) or linear, but then leaves undivided.

The genus includes two species distributed in East Asia.

1. Entire plant grayish due to dense, fine, mealy velutinous pubescence. Leaves undivided, lanceolate or linearly lanceolate. Capitula rather small.................................1. **K. integrifolia** Turcz.

123

+ Plants glabrous; leaves almost glabrous, thin, crenate-toothed, sometimes coarsely toothed, along margin somewhat scabrous. Capitula larger than in previous species.. ....2 **K. incisa** (Fisch.) DC.

1. **K. integrifolia** Turcz. in DC. Prodr. V. (1836) 182 and in Fl. baic.-dah. II (1856) 17; Ldb. Fl. Ross. II, 483; Maxim. Prim. Fl. Amur. 146; Herder in Bul. Soc. Nat. Mosc. I (1865) 385; Freyn in Oest. Bot. Zeit. (1902) 113. —*Aster integrifolius* Franch. in Mém. Soc. Sc. Nat. Cherbourg XXIV (1894) 224; Pl. David. (1889) 160, non Nutt. —*A. holophyllus* Hemsl. in Journ. Linn. Soc. XXIII (1888) 412; Kom. Fl. Manchzh III (1907) 596; Nakai, Fl. Kor. II (1911) 7; Ej. Fl. Kor. XIV

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[1] Treatment by S.G. Tamamschjan.

[2] The word *Kali* of Arabic origin was used to refer to the plants of sea coasts. In the ancient world, *Kalimeris* or simply *meris* referred to the Old World asters.

(1923) 103; Kitagava, Index Fl. Gehol. (1936) 52. —*Asteromoea pekinensis* Hance in Ann. Sc. Nat., sér. 4, XV (1861) 225. —*A. integrifolia* Loes. in Beih. Centralbl. XXXVII, II (1919) 189; Hand.-Mazz. Symb. Sin. 4 (1936) 1089.

Perennial. Rhizome long, branched. Stem erect, straight, up to 70 cm high somewhat sulcate, in upper part with scattered stiff hairs. Basal and lower cauline leaves shedding after flowering; most middle leaves crowded, lanceolate or oblanceolate or linearly lanceolate, 5–7 cm long, 0.4–1.5 cm wide, obtuse or acute, narrowed toward base, sessile, with undivided, somewhat thickened margin, green or grayish, weakly pubescent above, gray beneath due to denser, soft, more or less velutinous or mealy pubescence; apical leaves on peduncles linear, gradually reduced toward upper part of peduncle, obtuse, but cuspidate. Capitula on long peduncles in lax corymbs, about 2 cm wide, with small bracteal leaves, resembling involucral bracts. Involucre hemispherical, 7–8 mm wide; involucral bracts three-rowed, lanceolate, dorsally soft or more or less coarsely pubescent with occasional glands, ventrally green; outer bracts slightly shorter than inner ones, all acuminate. Ligulate florets one-rowed, corolla tube hairy, up to 3 mm long like in small disk florets, appendages of style branches obtuse. Achene compressed, obovoid, roundish above, basally attenuate. Pappus absent; instead with sparse, unequal bristles, not more than 0.5 mm long. Flowering VIII–IX.

Meadows along rivers, grassy slopes. —*Eastern Siberia*: Dauria. *General distribution*: China, Japan. Described from northern China from the banks of the Amur River. Type in Leningrad.

2. **K. incisa** (Fisch.) DC. Prodr. V (1836) 258; Kitamura, Comp. Jap. I (1937).— *K. platycephala* Cass. in Dict. Sc. Nat. XXI (1826) 325. —*Calimeris incisa* Turcz. Fl. baic.-dah. II (1856) 17; Ldb. Fl. Ross. II, 482; Maxim. Prim. Fl. Amur. 145; Rgl. Tent. Fl. Uss., 83; Schmidt, Fl. sach. 49.— *Calimeris platycephala* Nees, Syn. Gen. Sp. Aster. (1832) 227. —*Grindelia incisa* Spreng. Syst. Veg. III (1826) 575. —*Boltonia*
124 *incisa* Benth. Fl. Hongk. (1861) 175; Fr. and Sav. Enum. Fl. Jap. I (1875) 225. —*Aster incisus* Fisch. in Mém. Soc. Imp. Nat. Mosc. III (1812) 76; Kom. Fl. Manchzh. III (1907) 598; Nakai, Fl. Kor. II (1911) 7; Tokyo Bot. Mag. XXXIII (1919) 219, p. p. —*A. pinnatifidus* Makino f. *robusta* Makino in Tokyo Bot. Mag. XXVII (1913) 115. —*A. macrodon* Lév. and Van. in Bull. Acad. Geogr. Bot. XX (1909) 141.

Perennial. Rhizome creeping, root collar densely pubescent. Stem straight, stiff, up to 1.0–1.5 cm long, cylindrical, sulcate, glabrous below, hairy above, branched; branches straight, divaricate. Lower and middle leaves lenceolate or oblong-lanceolate, sessile, narrowed toward base, cuspidate above, crenately lobed or crenately toothed, lobes sinuate;

lamina thin, obtuse but cuspidate, lustrously green above, along margin scaberulous or glabrous, more pale, beneath matte; upper leaves linearly lanceolate, undivided, acuminate. Capitula in lax corymb on long peduncles, solitary; bracteal leaves like involucral bracts. Involucre hemispherical; involucral bracts three-rowed, lanceolate, membranous-herbaceous; outer bracts slightly shorter than inner, acuminate, cartilaginous, dorsally ciliate and green inner bracts. Corolla of ligulate florets up to 20 mm long, like disk florets hairy outside. Achene obovoid highly compressed, roundish above, covered with scattered hairs. Pappus of sparse, unequal, very short, not more than 1 mm long, acute, reddish bristles. Flowering VIII–IX.

Wet meadows. —*Eastern Siberia*: Dauria; *Far East*: Ussuri, Zea-Bureya. *General distribution*: Northern China. Described from Siberia. Type in Leningrad.

GENUS 1467. **Asterothamnus** Novopokr.[1, 2]

Novopokr. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR (1950) 330. —*Kalimeris* Cass. in DC. Prodr. V (1836) 259, p. p

Capitula solitary terminal on stem and branches, or three to five aggregated in corymbs, heterogamous, with ligulate or only with tubular flowers. Involucre imbricate, bracts coriaceous, acute, usually very dissimilar in shape and size, with wide, whitish membranous margin and brownish or reddish prominent midrib. Receptacle more or less flat, alveolate; alveolae with membranous edges, unequally toothed; teeth as long as ovary. Ligulate florets two times as long as involucre, blue, bright violet, or whitish-pink, pistillate, fertile; disk florets bisexual with yellow corolla; anthers at base obtuse; appendages of style branches
125 of disk florets triangular. Achenes covered with appressed, stiff, upward directed hairs, denser along edge, three-angled with one convex and two flat or more or less concave sides, and three ribs: two along edges and one indistinct rib on convex side. Pappus usually white, less often ferruginous or dull-smoky due to scabrous toothed hairs as long as corolla of tubular florets, sometimes with shorter outer hairs. Strongly branched semishrubs with woody rhizome and numerous gray-tomentose or finely puberulent stems with characteristic small, oval or almost linear, revolute leaves.

Four out of the seven species are with us.

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[1] Treatment by S.G. Tamamschjan.

[2] From the generic name *Aster*, and the word *thamnos*—bush.

1. Pappus ferruginous-brown or grayish-brown. Involucral bracts narrow, lanceolate or oblong; outer and inner bracts little differing from each other..............1. **A. heteropappoides** Novopokr.

+ Pappus white or slightly yellow, sometimes grayish. Involucral bracts broader, considerably differing from each other; outer bracts more or less ovate or lanceolate, inner narrower and two-times longer..2

2. Plant gray or whitish-gray due to dense tomentose pubescence. Capitula always with ligulate florets...2. **A. poliifolius** Novopokr.

+ Plant with less dense pubescence. Capitula often without ligulate florets..3

3. Stems virgate. Involucral bracts white or greenish at tip. Capitula usually with ligulate florets; disk florets yellow. Rather large plants, up to 40–45 cm high...3. **A. fruticosus** (Winkl.) Novopokr.

+ Stems branching several times, but not virgate. Inner and outer involucral bracts with purple tips. Capitula without ligulate florets; all florets somewhat purple. Shorter plants, 20–25 cm high..4. **A. schischkinii** Tamamsch.

1. **A. heteropappoides** Novopokr. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XIII (1950) 345. —*Aster heteropappoides* Novopkr. in herb.

Perennial. Short, up to 12 cm high, semishrub, strongly branched from base. Stem and leaves arachnoidly grayish-woolly; branches densely leafy. Leaves 10–12 mm long, 1.5 mm wide, oblong-linear, revolute, obtuse, but with short cartilaginous cusp. Capitula terminal on peduncles, solitary or three to six. Involucre weakly pubescent; involucral bracts more or less herbaceous, narrowly lanceolate, oblong or linear, acuminate; inner bracts almost as long as middle and outer ones. Capitula 126 with many florets; ligulate (pistillate) florets about six, tubular (disk) florets up to 40; ligules violet, 7.5 mm long, 1 mm wide. Pappus up to 4 mm long, brownish in beginning, later turning rusty or reddish-ocher. Flowering VII–IX.

Coarse sandy and gravelly soils; desert steppes on old, long-fallow lands. —*Western Siberia*: Altai; *Eastern Siberia*: Angara-Sayans. *General distribution*: Western Mongolia. Described from Mongolia from Lake Ubsa. Type in Leningrad.

2. **A. poliifolius** Novopokr. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk. SSSR, XIII (1950) 343.

Perennial. Semishrub, 20–25 cm high, strongly branched from base, gray or whitish-gray due to strongly tomentose, appressed entangled hairs. Leaves oblong, oblong-lanceolate, or linear, 15–25 mm long, 2.5–4.0 mm wide; lower leaves larger and broader, one-veined, revolute, on both sides arachnoid-hairy-tomentose. Peduncles with one to five capitula, usually on short leafy stalks. Involucre obovoid or hemispherical, 7 mm long, imbricate, arachnoid-hairy-tomentose; outer involucral bracts ovate, inner ones lanceolate, sometimes colored at apex. Ligulate florets bright violet, two times as long as involucre; tubular florets two times (12–13) more in number than ligulate florets. Achenes covered with appressed hairs; pappus white. Flowering VII–IX. (Plate IX, Fig. 2).

Pebble beds, debris and stony soils in steppes, rocky slopes. — *Eastern Siberia*: Angara-Sayans (along the Choza, Sterliga and Orupunshim rivers). *General distribution*: Western Mongolia. Described from Mongolia. Type in Leningrad.

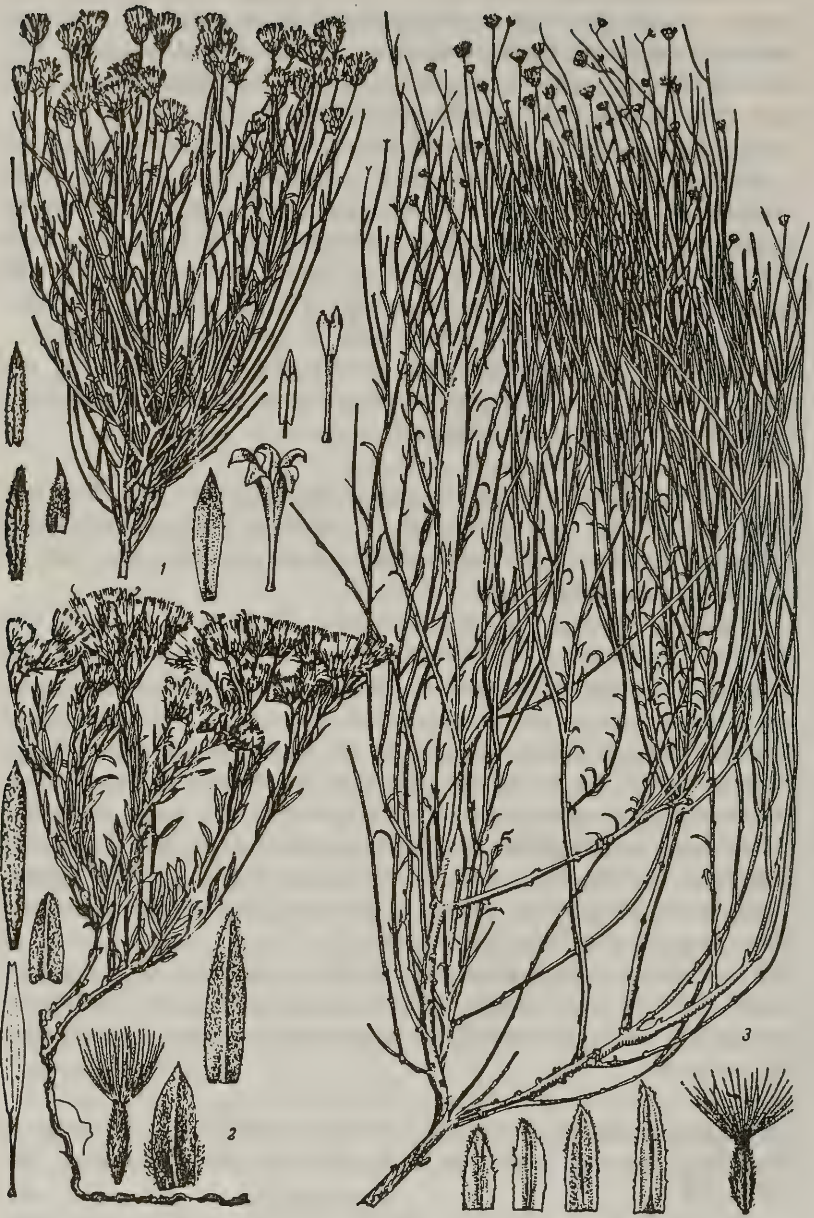
3. **A. fruticosus** (Winkl.) Novopokr. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XIII (1950) 337. —*Calimeris fruticosus* Winkler in Tr. Peterb. Bot. Sada, IX (1886) 419. —*Aster fruticosus* auct. non L.: B. Fedtsch. Rast. Turk. (1915) 730.

Perennial. Strongly branched semishrub, up to 40–45 cm high, with numerous virgate, thin, stems light yellow or straw colored below and more or less green, finely arachnoid-hairy-tomentose and rather densely leafy above. Leaves gradually reduced upward, revolute, one-veined. arachnoid-hairy-floccose. Capitula in lax corymbs with or sometimes without ligulate florets; ligules pale blue. Involucre imbricate; involucral bracts weakly pubescent with scarcely visible hairs; outer and middle
129 bracts ovate or lanceolate, inner oblong, all more or less coriaceous, with wide whitish fringe along midrib, green or dark brown. Achenes ovoid-oblanceolate, pilose. Pappus white, two times as long as achenes. Flowering VII–IX. (Plate IX, Fig. 3).

Calcareous soils, sandy-rocky foothills and stony river beds. — *Soviet Central Asia*: Pamiro-Alai. *General distribution*: Dzhungaria-Kashgaria. Described from Alga River between Kashgar and Turfan. Type in Leningrad.

4. **A. schischkinii** Tamamsch. in Addenda XXIV, 581. —*A. fruticosus discoideus* Novopokr. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XIII (1951) 338.

Perennial. Short semishrub, 20–25 cm high, more or less dwarf, strongly branched. Stems slender, numerous, not virgate, grayish-brownish below, dark straw-colored in middle, grayish-green above due to weak tomentose pubescence, rather densely leafy. Leaves 10–15 mm long,



127 Plate IX.

1—*Asterothamnus schischkinii* Tamamsch., habit, involucral bract, disk floret, anther, style; 2—*A. poliifolius* Novopokr., habit, involucral bract, peripheral floret, achene; 3—*A. fruticosus* (Winkl.) Novopokr., habit, involucral bract, achene.

1.0–1.3 mm wide, linear, one-veined, strongly revolute, acuminate, densely pubescent on both sides with entangled hairs, gradually reduced upward. Capitula in compact corymb, single-headed; small, 1.0–1.5 cm long, globose, narrowed downward; peduncles leafless, grayish-pubescent. Involucral bracts imbricate, three-rowed, pubescent, red or purple along midrib and margin, with triangular, acuminate apex; outer bracts considerably shorter, lanceolate and more strongly pubescent than inner together with middle bracts; sometimes involucral bracts entirely pink with darker purple vein. All florets sometimes homochromous, tubular; corolla usually purple or pink, less often yellowish, corolla tube somewhat densely pubescent. Achenes pubescent when young with straight, appressed, as well as upward directed hairs, not so strongly as in previous species and hairs not so long, reaching just above base of pappus; mature achenes brown, weakly pubescent. Pappus white, pappus hairs distinctly barbed. Flowering VII–VIII. (Plate IX, Fig. 1).

Stony rocky slopes, pebble-beds of river banks. —*Soviet Central Asia*: Tien Shan (Sarydzhas). Endemic. Described from mouth of Kainda River. Type in Leningrad.

GENUS 1468. **Krylovia** Schischk.[1, 2]

Schischkin in Fl. Zap. Sib. XI (1949) 2670. —*Rhinactina* Less. in Linnaea, VI (1831) 119, non Willd. (1807). —*Rhinactinidia* Novopokr. in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, No. 7 (1948) 114 and 134, nomen solum. Spisok Gerb. Fl. SSSR, XI (1949) 28

Capitula heterogamous and heterochromous (less often homochromous), solitary or in compound inflorescences. Involucral bracts three- or four-rowed, coriaceous, pubescent, along margin membranous or 130 membranous-ciliate, oblong or lanceolate; outer bracts obtuse. Receptacle slightly convex, alveolate; alveolae along edges slightly and unevenly white membranous, in middle punctate. Disk florets bisexual, tubular, slightly zygomorphic; corolla usually yellow, sometimes (in *K. limonifolia*) violet. Peripheral (ray) florets one-whorled, pistillate, with blue-violet ligulate corolla. Apical appendages of anthers narrowly triangular, acute; bases of anthers truncate, acuminate, very short-caudate. Style branches of bisexual florets with oblongly triangular appendages

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[1] Treatment by S.G. Tamamschjan.

[2] In honor of P.N. Krylov, the well-known investigator of the flora of Siberia. The name for this genus that would have priority is the one proposed by I.V. Novopokrovsky, which was published a few months earlier. However, it cannot be accepted because it was published without a single species combination being proposed.

at apex, outwardly more or less convex and pubescent; style branches of pistillate florets filiform or more or less flat up to tip. All achenes similar, narrow, finely ribbed, densely pubescent, brownish, with distinct ring at base. Pappus of white or dull-white bristles, somewhat thick in upper part, much shorter than ligules and slightly longer than achenes.

Perennial plants with many-headed, woody, thick rhizome, caulescent or acaulescent with entire leaves. All the three known species of this genus are found in the USSR.

1. Plants up to 5–40 cm high, with stem, branched peduncles bearing several capitula..2
+ Short, stemless plants, 2–10 cm high bearing numerous simple peduncles with solitary capitula...3
2. Pubescence of spreading hairs. Basal leaves with few teeth at apex. Ligulate florets not exceeding pappus...2. **K. popovii** (Botsch.) Tamamsch.
+ Pubescence of upcurved hairs. Basal leaves entire. Ligulate florets three times as long as pappus..1. **K. limoniifolia** (Less.) Schischk.
3. Leaves on both sides pubescent with crisped hairs. Peduncles eglandular, not sulcate..............3. **K. eremophila** (Bge.) Schischk.
+ Leaves glabrous above but densely short, stiff pubescent beneath with hooked hairs. Peduncles very short, sulcate, glandular................4. **K. novopokrovskyi** (Krasch. and Iljin) Tamamsch.

1. **K. limoniifolia** (Less.) Schischk. in Fl. Zap. Sib. XI (1949) 2670. —*Rhinactina limoniifolia* Less. Linnaea VI (1831) 119; Ldb. Fl. Ross. II, 485. —*Aster obovatus* Ldb. Fl. alt. IV (1833) 95; —*A. limoniifolius* Fedtsch. Rast. Turkestana (1915) 731. —*A. limoniifolius* M. Pop. in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, No. 7 (1948) 19. —**Ic.:** Ldb. Ic. pl. Fl. Ross. V, t. 492.

Perennial. Rhizome woody, many-headed. Entire plant covered with
131 short upcurved hairs; stems numerous, erect, short, 5–10 cm high. Basal leaves petiolate, lamina obovate or more or less oblong, shorter or sometimes as long as petiole, 2.5–5.0 cm long, 1.0–1.5 cm wide, obtuse or round at apex, entire; cauline leaves oblong or oblong-ovate, obtuse, lower leaves on short petioles, upper ones sessile. Peduncles more densely pubescent, branched, bearing few capitula. Involucre three-rowed; bracts oblong, stiff toward end of flowering, membranous-ciliate along margin; outermost bracts short, with often horizontal upper portion. Corolla of ligulate florets blue or violet, up to 20 mm long and 2–4 mm wide, central tubular florets yellow, somewhat zygomorphic with unequal teeth, one tooth slightly longer than others. Achenes scabrous, hairs somewhat

shorter than whitish pappus hairs; outer pappus hairs shorter. Flowering V–VI (Plate X, Fig.1).

On the edges of rocks and grassy slopes. —*Western Siberia*: Altai (Kurchum Mountains); *Soviet Central Asia*: Dzhungaria-Tarbagatai (Dzhungarian Alatau), Tien Shan, Pamiro-Alai. *General distribution*: Dzhungaria-Kashgaria, Mongolia. Described from western Siberia. Type in Berlin.

2. **K. popovii** (Botsch.) Tamamsch. comb. n. —*Aster popovii* Botsch. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVI (1954) 381. —*A. rupestris* M. Pop. ex Novopokr. ibid. VII (1938) 134; Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, 7 (1948) 9, non H.B.K. (1820). —*A. capusii* auct., non Franch.: Novopokr. op. cit. (1938) 132.— *Psychrogeton capusii* Novopokr. ex Krasch. in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, 3 (1936) 343 in adnot.— *Erigeron capusii* Novopokr. op. cit. (1938) 131. —*E. rupestris* M. Pop. op. cit. (1938) 134; ibid., VIII (1940) 50, non Hoppe and Hornsch. (1825); Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, 7 (1948) 9. —*E. pseuderigeron* var. *filicaulis* Novopokr. op. cit. (1938) 134.

Perennial. Plant with rather thick root and rosette of basal leaves. Leaves obovately spatulate or broad oval, obtuse, narrowed toward base into flat, short or more or less long petiole, indistinctly merging with lamina, in upper half usually coarsely toothed on upper margin, less often (var. *zeravschanica* Tamamsch.) undivided, including petiole up to 10 cm long, 2 cm wide, grayish due to short coarse pubescence; lamina only with one distinct midrib. Peduncles arising from axils of basal leaves in rosette, slender, terete, ascending, grayish due to dense short pubescence, weakly branched, 7–30 cm long, leafy; leaves on peduncles gradually reduced upward, 1–2 cm long, 0.5–1.0 cm wide, elliptical with distinct midrib, often numerous, grayish due to pubescence. Capitula 1.0–1.5 cm long, three to seven in paniculate inflorescence on thin peduncles with very small leaves below capitulum. Involucre two- or three-rowed; involucral bracts more or less linear, outer
132 shorter than inner, densely puberulent, obtuse, at flowering imbricately appressed, at fruiting all recurved. Receptacle usually bare. Corolla of peripheral florets pinkish or slightly violet, two- or three-toothed, up to 2 mm long, more densely pubescent outside than corolla tube of disk florets. Achenes 2–3(5) mm long, more or less flat, appressed-hairy, almost as long as pappus; pappus hairs weakly barbed. Flowering VIII–IX. (Plate X, Fig. 3).

Limestones, rock crevices.— *Soviet Central Asia*: Tien Shan, western Pamiro-Alai. Endemic. Described from the Talass Alatau Range. Type in Tashkent.

Note. This species had been included sometimes in *Aster*, sometimes in *Erigeron, Psychrogeton,* or *Conyza* (Krascheninnikov and Novopokrovsky). In its habit it is similar to *Krylovia eremophila* Bge., but is sharply distinguished by a number of distinctive characters.

3. **K. eremophila** (Bge.) Schischk. in Fl. Zap. Sib. IX (1949) 2671. —*Aster eremophilus* Bge. in Mém. Acad. Sc. Pétersb., sav. etr. II (1835) 103; Krylov, Fl. Alt. 590. —*Rhinactina uniflora* Bge. ex DC. Prodr. V (1836) 279; Ldb. Fl. Ross. II, 485.

Perennial. Root thick, woody, many-headed; plant stemless with numerous simple peduncles, 2.5–8.0 cm high, very densely or somewhat sparsely covered with crisped hairs. Basal leaves numerous, 1.5–2.5 cm long and 2–5 mm wide, lanceolate, less often almost linear, sometimes oblong-obovate, acute, narrowed into petiole, petiole as long as lamina or shorter, lamina densely covered with crisped hairs mainly beneath. Involucral bracts lanceolate, acute; outer bracts broader and short, narrowly membranous along margin, sometimes membranously ciliate, in lower half floccose or almost smooth. Disk (central) florets yellow, tubular, zygomorphic, one longer inner tooth of corolla noticeably longer than other four teeth; corolla of ligulate florets bright violet, usually spirally recurved after flowering, up to 15 mm long, 2.5–4.5 mm wide. Achenes oblong, obovoid, densely pubescent, initially straw-yellow, brownish when mature, somewhat shorter than dull- or yellowish-white hairs of one-rowed pappus. Flowering VI–VII. (Plate X, Fig. 2).

135 Steppe and dry debris slopes at 1200–1300 m. —*Western Siberia*: Irtysh (Aktau Mountains), Altai; *Soviet Central Asia*: Balkhash Region. *General distribution*: Dzhungaria-Kashgaria, Mongolia. Described from the Altai. Type in Leningrad.

4. **K. novopokrovskyi** (Krasch. and Iljin) Tamamsch. comb. nova. —*Aster novopokrovskyi* Krasch. and Iljin in Bot. Mat. Gerb. V. (1924) 172. —*Rhinactina novopokrovskyi* Krasch. and Iljin, ibid.

Perennial. Short statured stemmed or stemless plant; rhizome thick with numerous remains of leaves and adventitious roots. Leaves numerous, 4–7 cm long, 6–15 mm wide, oblong-ovate or broadly lanceolate, spatulate, long petiolate, entire, obtuse, sometimes slightly sinuate, three- or five-veined, densely glandular-hairy above, ciliate beneath along veins, fimbriate-setaceous along margin, veins prominent above; petiole basally flat, ciliate. Capitula large, up to 1 cm wide, solitary, sessile or on short, somewhat sulcate peduncle, glandular. Involucre two- or three-rowed; involucral bracts linear. one-veined, scarious, obtuse, glabrous or with occasional glands, along margin membranous and ciliate. Receptacle punctate, alveolate. Corolla of tubular florets 4–5 mm long, hairy in upper part, slightly zygomorphic; ligulate florets few with 7–9 mm long corolla, basally pubescent. Immature achenes about 1.5 mm long, somewhat ribbed, compressed and coarsely pubescent. Pappus almost as long as florets, double, outer row of hairs somewhat shorter than inner one. Flowering V–VI.

Debris slopes. —*Eastern Siberia*: Yenisei (Podkamennya Tunguska). Endemic. Described from Siberia from the Podkamennaya Tunguska River. Type in Leningrad.

GENUS 1469. **Arctogeron** DC.[1,2]

DC. Prodr. V (1836) 260

Capitula solitary on scapes, heterogamous, heterochromous. Involucre imbricate, three-rowed; bracts lanceolate, acuminate, dorsally carinate and white-membranous along margin. Receptacle narrow, flat, somewhat punctate. Ligulate florets one-rowed, white or pinkish-white, two-times as long as involucre, oblong-ovate, toothed in upper part. Disk florets tubular, yellow. Appendages of style of both disk and ligulate florets short and thick. All florets fertile. Achene oblong, very densely silvery-pubescent. Pappus simple, many-rowed, of almost identical scabrous bristles. Perennial, caespitose herbs, with many floriferous scapes and narrow, grasslike leaves. Monotypic genus.

136 1. **A. gramineum** (L.) DC. Prodr. V. (1836) 260; Ldb. Fl. Ross. II, 484. —*Erigeron gramineum* L. Sp. pl. (1753) 864. —**Ic.:** Gmelin, Fl. sib. II (1749), tab. LXXVI, fig. 2.

Perennial. Rhizome branched, ascending; root thick, vertical, sometimes twisted; floriferous scapes two to five(six), in lower portion covered with dry remains of previous year's leaves, from which arise rosettes of new grayish-green leaves. Leaves 5–10 cm long, narrow, less than 1 mm wide, almost setaceous, stiff, with somewhat sheathing base, somewhat concave in upper portion so that their margins bend upward, with thick midrib, with five stiff, cilia along margin, on both sides glabrous or pubescent. Floriferous scapes with solitary capitulum, two times as long as, sometimes equaling leaves, finely sulcate, reddish, particularly above, more intensely below capitulum, densely pubescent with long flexuous many-celled hairs. Capitula 1.5–2.0 cm wide. Involucre campanulate, three-rowed, imbricate; bracts narrowly lanceolate, green, densely puberulent along keel and broadly white-membranous

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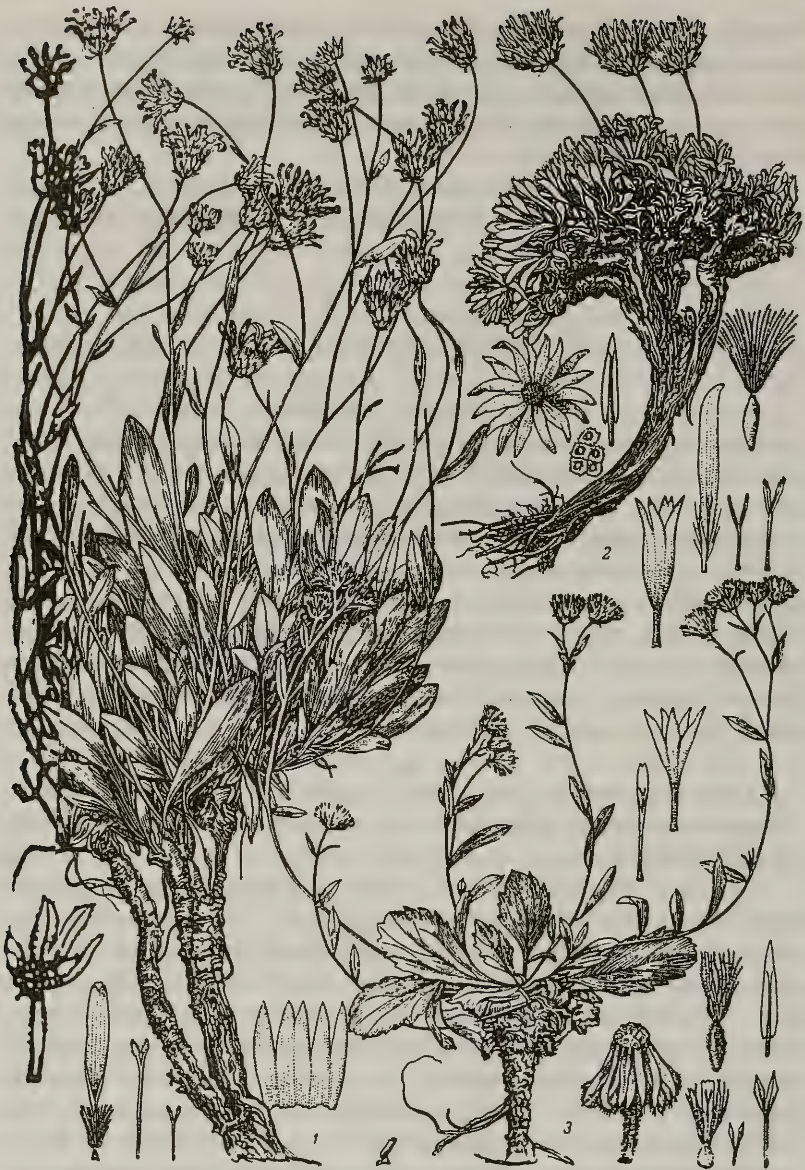
[1] Treatment by S.G. Tamamschjan.

[2] From the Greek word *arctos*—northern, and the generic name *Erigeron*.



133 Plate X.

1—*Krylovia limoniifolia* (Less.) Schischk., habit; capitulum with exposed receptacle, ligulate floret with young achene, style of tubular and ligulate florets, limb of disk floret; 2—*K. eremophila* (Bge.) Schischk., habit, capitulum with exposed receptacle, part of receptacle, stamen, disk floret, ligulate (ray) floret, achene, style; 3—*K. popovii* (Botsch.) Tamamsch., habit, ligulate floret, disk floret, capitulum with exposed receptacle, achene, stamen, achene with pappus and short ligulate corolla, style of ray and disk florets.

along margin; inner bracts sometimes longer, with longer membranous, straight or solitary recurved, sometimes red, tip. Ligulate florets two times as long as involucre, after flowering recurved and then just slightly exserted from the corolla. Achene oblong, somewhat ribbed, densely pubescent with silvery, upcurved hairs; pappus of white bristles, as long as or longer than disk florets, half as long as peripheral ligulate florets and almost two times as long as the achene. Flowering V–VI. (Plate VIII, Fig. 3).

Steppes, stony slopes. —*Western Siberia*: Altai, Irtysh (south); *Eastern Siberia*: Angara-Sayans, Dauria. Endemic. Described from Dauria. Type in Geneva; cotype in Leningrad.

GENUS 1470. **Turczaninowia** DC.[1,2]

DC. Prodr. V (1836) 257; Ldb. Fl. Ross. II (1846) 481

Capitula many-flowered, heterogamous, heterochromous, aggregated in corymb, compressed at base. Involucre tubular-campanulate; involucral bracts usually three-rowed, more or less linear, scarious along margin, dorsally green, herbaceous, obtuse, somewhat shorter than disk. Receptacle punctate, along edges incised-membranous. Disk florets tubular, bisexual or some only staminate, with yellow corolla, short sytlopodia, together with triangular appendages included in corolla tube; ligulate florets pistillate, fertile, usually 7–10, one-whorled, with white, 137 two- or three-toothed ligules and narrow, elongated stylopodia. Achene ovoid, terete, sometimes slightly compressed, along edges costate, without veins above, dark brown or blackish, initially pubescent, glabrous or slightly pubescent when mature. Pappus of all achenes identical, dull white or pink, of almost identical, numerous, thin setaceous hairs.

A biennial plant resembling *Galatella* in habit with a simple, usually solitary stem; leaves spiral, entire or in part finely broad-toothed, linear-lanceolate and lanceolate, acuminate, with prominent midrib beneath. A monotypic genus, found in China, Mongolia and Japan besides the USSR.

1. **T. fastigiata** (Fisch.) DC. Prodr. V (1836) 258; Ldb. Fl. Ross. II (1846) 482; Turcz. Fl. baic.-dah. II, 16; Maxim. Prim. Fl. Amur. 135; Korsh. in Tr. Peterb. Bot. Sada, XII, 350. —*Aster fastigiatus* Fisch. in Mém. Soc. Nat. Mosc. III (1812) 74; Kom. Fl. Manchzh. III, 600. —*A. micranthus* Lév. and Van. in Bull. Acad. Geogr. Bot. XX (1919) 140. —

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[1] Treatment by S.G. Tamamschjan.

[2] Named in honor of N.S. Turczaninow (1796–1863), botanist and author of the classic *Flora of Baikal-Dauria*.

Calimeris japonica Schultz Bip. in Zoll. Syst. Verz. Ind. Archip. (1855) 126. —**Ic.:** Kom. and Alis. Opredel. Rast. Dalnevost. Kr. II, Plate 303.

Perennial. Rhizome short, inconspicuous. Stem 30–80(100) cm high, simple, usually solitary, cylindrical, weakly sulcate, glabrous below, finely scabrous-hairy above. Lower leaves often shedding before flowering, linear-lanceolate or lanceolate, including petiole 12–15 cm long, lamina indistinctly merging with flat, narrow, petiole, shortly sheathing, glabrous; upper and middle leaves gradually reduced upward, lanceolate, sessile, weakly above, densely and appressed pubescent beneath, revolute with glandular, thick, more or less barbed bristles along margin; uppermost leaves in inflorescence 2–3 mm long. Peduncles densely canescent. Capitula small, 5–9 mm wide; peduncles of third-fourth order thin, bearing two or three small bracteal leaves, sometimes gradually terminating into involucral bracts. Involucre tubular-campanulate or broadly campanulate; outer involucral bracts expanded in upper portion, obtuse, densely pubescent; inner bracts oblanceolate, acuminate, along margin broadly membranous, in middle and at tip more or less herbaceous and densely pubescent, much shorter than ligulate florets. Ligulate florets white, often obtuse, usually without teeth, their corolla tube almost as long as ligule; style appendages narrow, projecting somewhat above base of ligule; lobes of limb of disk florets sometimes unequal. Achenes initially pubescent, but almost glabrous when mature, brown, with darker glandular dots, small, hardly 1 mm long, ovoid, not or slightly flat, terete. Pappus dull white, pinkish or reddish, 3–4 mm long, three times as long as achene, consisting of identical, 138 simple, somewhat setaceous hairs, as long as or shorter than tubular disk florets and significantly shorter than ligulate florets. Flowering VII–IX.

Wet riverbank meadows of mixed herbs. —*Eastern Siberia*: Dauria; *Far East*: Ussuri. *General distribution*: Mongolia, China, and Japan. Described from banks of Argun River. Type in Leningrad.

Note. The Far Eastern specimens of this species can be distinguished somewhat from the East Siberian ones by their much denser pubescence, smaller leaves, and not one but several stems arising from single rhizome.

GENUS 1471. **Galatella** Cass.[1, 2]

Cass. in Dict. sc. nat. XXXVII (1825) 463, 488. —*Galatea* Cass. in Bull. Soc. Philom. (1818) 165 and in Dict. sc. nat. XVIII (1820) 56, non

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[1] Treatment by N.N. Tzvelev.

[2] Diminitive of Galatea (nymph in ancient Greek mythology); initially the genus was named *Galatea*, but later it was renamed, for nomenclatural reasons.

Salish. 1812. —*Galatella* (Cass.) Benth. and Hook. Gen. pl. II (1876) 273 p. p., Hoffm. in Pflanzenfam. IV, 5 (1894) 163, pro sect. gen. Asteris L.

Capitula small or medium, obconical to almost hemispherical, aggregated in simple or compound corymbose inflorescence, occasionally solitary. Involucral bracts many-rowed, imbricate, herbaceous, greenish, usually with much brighter, partly membranous margin, glabrous or puberulent, with one to three(five) more or less distinct veins, not identical; outer bracts smaller, lanceolate to lanceolately ovate, acute; innermost bracts larger and usually much brighter, oblong to oblong-lanceolate, obtuse or subacute, less often acute. Receptacle slightly convex, irregularly alveolate with cartilaginous-dentate edges of alveolae rising above it. Disk florets tubular, bisexual, yellow, sometimes with pinkish-violet tinge, 5–60(100) in many rows and usually one-and-one half to two times as long as involucre, corolla five-fid with lanceolate teeth or notches; peripheral florets ligulate, asexual (only in *G. divaricata* sometimes fertile, pistillate), pinkish- or bluish-violet of different shades, considerably (one-and-one-half to two times) longer than disk florets, one-whorled, 1–20, often absent. Anthers at apex with wide, lanceolate appendages, at base obtuse; filaments glabrous; style bifid with lanceolate or ovate-triangular appendages, almost as long as or one-third to two-thirds as long style branches. All achenes identical, oblong, narrowed towards base, more or less dorsally flat, without prominent longitudinal ribs, 2.5–4.5 mm long, uniformly covered with rather long semi-appressed hairs; hilum basal or subbasal. Pappus longer than achene,
139 5–8 mm long, whitish, sometimes with pinkish-violet tinge, of two(three) irregular rows of similar scabrous bristles, connate into ring at base. Perennial herbs with erect, more or less uniformly leafy stems, usually branched only at apex, arising from long nodose rhizome. Leaves alternate, sessile, oblong to narrowly linear, undivided and entire, often punctately glandular; lower and middle, or only lower, leaves three-veined, others one-veined, occasionally all leaves one-veined (then ligulate florets always present).

Lectotype: *G. punctata* (W. and K.) Nees ab Esenb. —*Galatea punctata* (W. and K.) Cass.

The genus *Galatella* includes about 40–45 species distributed in southern and central Europe and in a considerable part of Asia (up to the Arctic Circle in the north, northern provinces of Iran and India in the south, and Primorsk territory of the RSFSR and western provinces of China in the east. The *Flora of the USSR* treats 24 species.

Much new on the systematics of this genus in the territory of the USSR has been added by I.V. Novopokrovsky, who has published, in particular, monographic surveys of the species of *Galatella* from Soviet

Central Asia and Siberia (in *Tr. Bot. Inst. Akad. Nauk SSSR*, Ser. 1, No. VII, 1948, pp. 113–148, and in *Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR*, Vol. XI, 1949, pp. 211–233). The taxonomy of the Caucasian species of this genus and the interrelationships between *Galatella* and *Linosyris* are examined also in the work of L.M. Kemularia-Nathadze (in *Vestn. Tifl. Bot. Sada, Nov. Ser.*, No. 3–4, 1927, pp. 123–148). Following the traditions of the Russian botanical literature, I retain *Galatella* and *Linosyris* as separate genera, which were combined by I.V. Novopokrovsky, although perhaps it would have been more appropriate to consider all six sections treated here either as equivalent sections of *Galatella* (or *Aster* L. s. l.) or as a series of smaller genera. Moreover, the absence of any significant morphological differences between them in the structure of achenes, florets, common receptacle, etc., can hardly justify the latter view. For a final solution of this problem it is necessary to conduct a monographic study of all the groups of genera close to the genus *Aster* L.

Many species of the genus *Galatella* (*G. dahurica, G. punctata* and others) can be used as ornamental plants in gardens and parks.

1. Semishrubs, strongly branched at base, with numerous stems, 20–30 cm high; leaves very small (up to 1.5–2.0 cm long), punctately glandular on both sides or only above; capitula solitary or few in lax corymbs. The Ketmen Mountains (Section *Xylogalatella*)..18. **G. saxatilis** (M. Pop. ex Novopokr.) Novopokr.

+ Herbs with a different combination of characters........................2

140 2. Leaves never punctately glandular, lower leaves three-veined, middle and upper leaves one-veined or all leaves one-veined; capitula in lax corymbs, usually only few; almost glabrous or arachnoid-tomentose, relatively short plants, usually 30–40, less often up to 50–60 cm high..3

+ Leaves usually punctately glandular, occasionally not so, lower and middle leaves (occasionally only lower) three veined; capitula in compact or lax corymbs; covered with very short papillose hairs and small spines, occasionally almost glabrous plants, usually taller (100–120 cm high) (Section *Galatella*.....................8

3. Involucre almost hemispherical, outer involucral bracts lanceolate; ligulate florets always present; usually all leaves one-veined; plants almost glabrous. Eastern Tien Shan (Section *Oreophilon*)..4

+ Involucre broadly obconical, outer involucral bracts ovately lanceolate; ligulate florets present or absent; lower leaves three-veined; plants glabrous or pubescent (Section *Fastigiatae*)

....5

4. Leaves thick, crowded in mainly lower part of stem; plants 25–60 cm high.............................19. **G. tianschanica** Novopokr.

+ Leaves thin, more or less uniformly distributed over stem; plants 10–15 cm high.............................20. **G. polygaloides** Novopokr.

5. Plants green, glabrous or subglabrous; ligulate florets always present...6

+ Plants grayish-green, finely arachnoid-hairy, later floccose-tomentose...7

6. Lower, but often also middle, cauline leaves oblong, three-veined, 5–6 mm wide; middle and upper leaves lanceolately linear to linear, 2–3 mm wide, one- to three-veined; capitula larger (involucre 6–9 mm long and 9–14 mm wide), solitary or few. The Altai...21. **G. hauptii** (Ldb.) Lindl.

+ Only lowermost leaves linearly lanceolate (up to 3–4 mm wide), three-veined, other leaves usually narrowly linear, 1–2 mm wide, one-veined capitula much smaller (involucre 5–7 mm long and 8–12 mm wide), but more numerous. Widely distributed species ....22. **G. angustissima** (Tausch) Novopokr.

7. Lower leaves oblong, three-veïned, middle and upper leaves oblongly linear to linear, one-veined; involucre 6–8 mm long and 8–12 mm wide; ligulate florets present or absent..................... ....23 **G. divaricata** (Fisch. ex M.B.) Novopokr.

+ Only lowermost (fugaceous) leaves oblong, three-veined, other leaves narrowly linear, involute; involucre 10–15 mm long and 10–18 mm wide; ligulate florets always present............................ ....24. **G. scoparia** (Kar. and Kir.) Novopokr.

141 8. Only lowermost leaves three-veined, other leaves one-veined; plants branched at base with many stems; capitula fewer, in lax corymbs, always without ligulate florets. Eastern Tien Shan.......... ....8. **G. regelii** Tzvel.

+ Lower and middle cauline leaves three-veined (but lateral veins often visible only near base of lamina).......................................9

9. Plants glabrous or subglabrous (with insignificant mixture of very short papillose hairs), but usually strongly spinulose along margin of lamina...10

+ Leaves, besides spinules, densely covered with very short papillose hairs, sometimes also mixed with fine arachnoid-pubescence...11

10. Ligulate florets always present; leaves usually short-acuminate, scabrous due to numerous spines along leaf margin, visible even without magnifying glass. Mountains of Soviet Central Asia........ ....10. **G. coriacea** Novopokr.

+ Ligulate florets usually absent; leaves long-acuminate, less often short-acuminate, very weakly scabrous. Saline meadows............................7. **G. trinervifolia** (Less.) Novopokr.

11. Ligulate florets absent, very rarely one to three(four); widely distributed species......................6. **G. biflora** (L.) Nees ab Esenb.

+ Ligulate florets always present (usually five or more florets)..12

12. Stem and leaves, besides having spines and short papillose hairs, covered with very fine, arachnoid-hairy tomentum.................13

+ Fine, arachnoid-hairy tomentum present only in inflorescence or entirely absent...14

13. Stems erect; capitula with 15–25 florets, usually numerous, in compact or lax corymb. Transcaucasia..16. **G. sosnovskyana** Kem.-Nat.

+ Stems usually ascending at base; capitula with 20–40 florets, usually less numerous, sometimes solitary. Mountains of Soviet Central Asia..5. **G. villosula** Novopokr.

14. Capitula with 25–60(100) florets, relatively large but usually fewer in corymb, sometimes solitary; involucre broadly obconical to almost hemispherical. Siberia, Kazakhstan, Soviet Cental Asia 15

+ Capitula with (6)10–25 florets, smaller but usually more numerous; involucre obconical to broadly obconical......................18

15. Leaves abruptly acuminate; plants up to 50, occasionally up to 70 cm high. Mostly mountain-steppe plants of Altai and Tien Shan..16

142 + Leaves gradually acuminate; plants taller, 80–100 cm. Mainly associated with forests of river bottoms and low montane zone..17

16. Pappus entirely or partially with pinkish-violet tinge. Involucre usually broadly obconical, 5–7 mm long and 9–12 mm wide; involucral bracts dorsally almost glabrous. Mountains of Soviet Central Asia..............................4. **G. chromopappus** Novopokr.

+ Pappus whitish. Involucre almost hemispherical, 4–5 mm long and 7–10 mm wide; involucral bracts dorsally usually arachnoid-hairy, with short hairs.............................2. **G. altaica** Tzvel.

17. Entire plant densely pubescent with short hairs; capitula usually broadly obconical, smaller (8–12 mm long and 12–20 mm wide) but more numerous..........................3. **G. macrosciadia** Gandog.

+ Plant almost glabrous below; capitula almost hemispherical, larger (10–15 mm long and up to 25 mm wide), but fewer, often solitary...1. **G. dahurica** DC.

18. Innermost involucral bracts attenuate-acuminate. Kopetdag and Pamiro-Alai 19

+ Innermost involucral bracts obtuse or subobtuse.........................20

19. Pappus usually entirely or partially with pinkish-violet tinge; involucral bracts partly three-veined....12. **G. hissarica** Novopokr.

+ Pappus whitish; involucral bracts with one to three darker veins...13. **G. litvinovii** Novopokr.

20. Capitula obconical, with 6–16 florets, of which three to six are ligulate; involucral bracts usually one-veined; leaves short-acuminate, often obtuse...
.........................17. **G. dracunculoides** (Lam.) Nees ab Esenb

+ Capitula with 12–25 florets, of which 4–10 ligulate (if with fewer florets, then leaves long-acuminate); involucral bracts one- to three-veined..21

21. Capitula rather small, with 8–12 florets; leaves narrow with very weak lateral veins. Transcaucasia.....15. **G. eldarica** Kem.-Nat.

+ Capitula with 14–25 florets, larger...22

22. Involucral bracts with three veins, sometimes in part with one; dorsally glabrous or subglabrous; branches of rather compact corymb upcurved; leaves long-acuminate. Found mainly in forest and forest-steppe zones..
..................................9. **G. punctata** (W. and K.) Nees ab Esenb.

143 + Involucral bracts with one, sometimes in part with three veins; dorsally glabrous or pubescent; branches of somewhat compact corymb entirely or partly arcuate. Mainly in semidesert and desert zones..23

23. Involucral bracts dorsally glabrous or subglabrous; leaves generally subacute..............14. **G. pastuchovii** (Kem.-Nat.) Tzvel.

+ Involucral bracts dorsally puberulent, less often subglabrous; leaves generally acuminate. Soviet Central Asia
....11. **G. fastigiiformis** Novopokr.

Section 1. GALATELLA. —Sect. *Acres* Novopokr. in Izv. Ross. Ak. Nauk, Ser. 6, XII (1918) 2270, 2280, 2282. —Sect. *Stigmophyllum* Novopokr. in Tr. Bot. Inst. Akad. Nauk SSSR, Ser.1, VII (1948) 115 and in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XI (1948) 212. — Capitula usually rather numerous, with or without ligulate florets in compact or lax corymb, occasionally solitary; branches of corymb and peduncles of capitula usually straight. Involucre obconical to almost hemispherical; outer involucral bracts ovately lanceolate to lanceolate. Leaves usually punctately glandular, occasionally without glands; lower and middle (occasionally only lower) leaves three-veined, upper leaves (often only in inflorescence) one-veined. Usually tall (up to 100–120 cm high) plants, covered with very short, papillose hairs and spinules, sometimes mixed with fine, tomentose pubescence, occasionally almost glabrous.

Lectotype of genus: Type of this section.

Note. A large number of the species of this section, despite the considerable differences of the extreme types (e.g. *G. dahurica* and *G. dracunculoides*), are so closely related with each other that dividing it any further into lower taxonomic units (subsections or series) becomes artificial to a considerable extent. Nevertheless, for the sake of convenience I retain a slightly modified division of the section into the series proposed by I.V. Novopokravsky.

Series 1. Hemisphaericae Novopokr. in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, VII (1948) 115. —Capitula always with ligulate florets, relatively large, broadly obconical to almost hemispherical, with 25–60(100) florets; plants covered with short, papillose hairs and spinules, less often with mixture of arachnoid-hairy tomentum.

1. **G. dahurica** DC. Prodr. V (1836) 256; Ldb. Fl. Ross. II, 480; Turcz. Fl. baic.-dah. II, 14; Novopokr. in Izv. Ross. Ak. Nauk., Ser. 6, XII (1918) 2272 and in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk. SSSR, XI (1949) 223. —*Aster hauptii* Turcz. ex DC. op. cit. 256, in syn.; Ldb, op. cit. 481, in syn.; non Ldb., 1833. —*A. dahuricus* Benth. ex Baker, Gard. chr. I (1885) 208; Kom. Fl. Manchzh. III, 602. —**Exs.**: F. Karo, Pl. Amur. et Zeaens., No. 347; GRF No. 1223 a, b and 3256.

144 Perennial. Plant 25–80(100) cm high, covered with very short papillose hairs and spinules, weakly scabrous, almost glabrous below. Stems solitary or few, erect, branched above with few arcuately or obliquely upright branches terminating in one, less often several pedunculate capitula, often simple. Leaves linearly lanceolate or linear, up to 10 cm long and 0.8 cm wide, sessile, gradually narrowed toward base, long-acuminate with three distinct veins (except uppermost leaves), punctately glandular on both sides or only above, green, some bracteal leaves (on inflorescence branches) highly reduced. Capitula in lax corymbose inflorescence, less often solitary, relatively large, with 30–80(100) florets, 10–15 mm long and up to 25 mm wide (when flattened). Involucre almost hemispherical, 3.5–6.0 mm long and 8–12 mm wide; involucral bracts dorsally more or less pubescent to almost glabrous, along margin short arachnoidly fimbriate, usually three-veined; outer bracts lanceolate, gradually acuminate, almost entirely herbaceous, greenish; innermost bracts larger, oblong or oblongly lanceolate, obtuse or subacute, bright yellowish-green (tip sometimes pinkish), with narrow membranous margin. Disk florets numerous, pale yellow, often with pinkish-

violet tinge; ligulate florets 8–20, pinkish-violet; appendages of style branches half to two-thirds as long as branches. Achenes 3.5–4.0 mm long, relatively sparsely hairy; pappus 6.5–8.0 mm long, whitish. Flowering VII–IX. (Plate XII, Fig. 1).

Scrubs, forest fringes, meadows; up to the lower mountain zone. — *Eastern Siberia*: Yenisei, Lena-Kolyma, Angara-Sayans (eastern part), Dauria; *Far East*: Zeya-Bureya, Uda River area, Ussuri. *General distribution*: Mongolia (northern part), China (northeastern part). Described from Irkutsk Province, from Irkut River. Type and isotype in Leningrad.

Note. The border between the ranges of this species and *G. macroseiadia* passes approximately along the Eastern Sayan Range, where populations transitional between both species are often found.

2. **G. altaica** Tzvel. sp. nova in addenda XXIV, 582. —*G. bipunctata* Novopokr. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XI (1942) 221, p. p. (quoad spec. Alt. austro-orient.).

Perennial. Plant 20–50 cm high, densely covered with very short papillose hairs and (particularly along leaf margins) spinules, with insignificant mixture of very fine tomentose hairs above, weakly scabrous. Stems solitary or few, erect, but basally often ascending, branched above, with few arcuately or obliquely upright branches terminating in one, less often two pedunculate capitula. Leaves oblong to linearly-lanceolate up to 6 cm long and 1.2 cm wide, sessile, narrowed towards
145 base, short-acuminate, three-veined (lateral veins often not prominent throughout), punctate on both sides, less often only above, dull green, some bracteal leaves (on inflorescence branches) highly reduced. Capitula aggregated in corymbose inflorescence, relatively large, with 25–50 florets, 10–14 mm long and 13–20 mm wide (when flattened). Involucre almost hemispherical, 4–5 mm long and 7–10 mm wide; involucral bracts dorsally more or less pubescent to almost glabrous, along margin short tomentose-fimbriate with three-, less often one-veined; outer bracts ovately lanceolate, acute, greenish; innermost bracts larger and brighter, oblong, obtuse or subacute, with narrow membranous margin. Disk florets numerous, pale-yellow, sometimes with pinkish-violet tinge; ligulate florets 8–15, pinkish-violet, of different shades; appendages of style branches one-third to half as long as branches. Achenes 3.5–4.5 mm long; pappus 6–7 mm long, whitish. Flowering VII–IX.

Highland steppes, thin forests, scrubs; mainly in middle mountain zone. —*Western Siberia*: Altai (south-eastern part). *General distribution*: Probably Mongolia (northwestern part). Described from the Altai (Kosh-Agachskii administrative district of the Gorno-Altai Autonomous

Province, Chui steppe, the Kzyl-Chin Ravine, 1 VII, 1937, A.V. Kalinina). Type in Leningrad.

Note. Quite a large number of herbarium specimens at the Botanical Institute of the Academy of Sciences of the USSR from the southeastern Altai (basin of the Chui River) represent a morphologically fully stable ecogeographical race of *Galatella* as an intermediate between *G. dahurica, G. macrosciadia,* and *G. chromopappa*. These specimens were referred to *G. bipunctata* by I.V. Novopokrovsky, which he himself described; however the type of this species (perhaps unfortunately selected), from the region of the town of Zmeinogorsk, as well as other specimens of *G. bipunctata* from the western and northwestern Altai, in our opinion, are hardly distinguishable from *G. macrosciadia.*

3. **G. macrosciadia** Gandog. in Bull. Soc. Bot. France, LXV (1918) 41; Novopokr. in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, VII (1948) 115 and in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR XI (1949) 222; Krylov, Fl. Zap. Sib. XI (1949) 2674. —*G. punctata* auct. non Nees ab Esenb: Kryl. Fl. Alt. III (1904) 591, p. p. —*G. biflora* auct. non. Nees ab Esenb.: Novopokr. in Izv. Ross. Ak. Nauk, Ser. 6, XII (1918) 2272, p. p. —*G. songarica* Novopokr. op. cit. (1948) 116; Krylov, op. cit. (1949) 2675. —*G. tarbagatensis* Novopokr. op. cit. (1948) 116, in syn. —*G. bipunctata* Novopokr. op cit. (1949) 221, p. p. —*G. biflora* (L.) Nees ab Esenb. ssp. *bipunctata* (Novopokr.) Serg. in Krylov op. cit. (1949) 2673. —*Aster macrosciadius* Novopokr. op. cit. (1948) 115, in syn. —*A. songoricus* Novopokr. op. cit. (1948) 116, in syn. —*A. bipunctatus* Novopokr. op. cit. (1949) 221, in syn. —**Ic.**: Novopokr. op. cit. (1948) 125, Plate IV, Fig. 2; 131, Plate VI. —**Exs.**: GRF No. 1365 (under *Aster acer* var. *typicus* Korsh.).

146 Perennial. Plant 25–80(100) cm high, covered with very short but dense papillose hairs and spinules, often with insignificant mixture of very fine tomentose hairs above, weakly scabrous. Stems solitary or few, erect, branched above, with relatively few obliquely upright branches terminating into one or many pedunculate capitula. Leaves linearly lanceolate or linear, up to 8 cm and 0.8 cm wide, sessile, gradually narrowed toward base, long-acuminate, three-veined, except uppermost leaves; punctately glandular on both sides, less often only above, dull green, bracteal leaves (on inflorescence branches) highly reduced. Capitula in compact or lax corymbose inflorescence with 25–60 florets, 8–12 mm long and 12–20 mm wide (when flattened), relatively large. Involucre broad obconical to almost hemispherical, 3.5–5.0 mm long and 5–8 mm wide; involucral bracts greenish, dorsally more or less pubescent to almost glabrous, along margin shortly, tomentose-fimbriate, three-veined, less often with one vien; outer bracts ovately lanceolate

to lanceolate, acute; innermost bracts larger and brighter, oblong, obtuse or subacute, with narrowly membranous margin. Disk florets numerous pale-yellow, sometimes with pinkish-violet tinge; ligulate florets 6–15, pinkish-violet, of different shades; appendages of style branches half to two-thirds as long as branches. Achenes 2.5–4.0 mm long; pappus 5–6 mm long, whitish. Flowering VII–IX.

Scrubs, thin forests, meadows; up to lower mountain zone. —*Western Siberia*: Ob Region (southern part), Irtysh, Altai (northern and western parts); *Eastern Siberia*: Angara-Sayans (western part); *Soviet Central Asia*: Aralo-Caspian (the Ulu-Tau Mountains), Balkhash Region (sporadically), Dzhungaria-Tarbagatai. *General distribution*: Mongolia (northwestern part). Described from the vicinity of the city of Tobolsk. Type in Lyon; isotype in Leningrad.

Note. Following I.V. Novopokrovsky, I include this species with *G. dahurica* in one series. It is necessary to mention that the morphological and geographical borders between *G. macrosciadia* and *G. punctata* are still less distinct than between *G. macrosciadia* and *G. dahurica*. As compared to *G. punctata, G. macrosciadia* is a more northern and eastern race, whose southern boundary of the range passes somewhat south of the cities of Tobolsk and Novosibirsk toward the foothills of the Altai. But, apart from that, *G. macrosciadia* shows up far to the west of the Altai in mountainous regions of Kazakhstan, which leads to still greater blurring of the boundaries between these species. I unite *G. songorica* with *G. macrosciadia*, which was described by I.V. 149 Novopokrovsky from eastern Kazakhstan, specimens of which are slightly different from the much narrower leaved and more densely pubescent specimens of *G. macrosciadia* from the hilly regions of Kazakhstan, but are hardly distinguishable from the Siberian material (including the type) of this last species. (Regarding *G. bipunctata*, see the note to the previous species.)

4. **G. chromopappus*** Novopokr. in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, VII (1948) 124, p. p. (excl. var. *obconica* Novopokr. and f. *discoidea* Novopokr.). —*Aster chromopappus* Novopokr. ibid. 124, in syn. —**Ic.**: Novopokr. ibid. 133, Plate VII, Fig. 1.

Perennial. Plant 25–70 cm high, covered with very short papillose hairs and spinules (particularly along leaf margins). Stems solitary or few, erect, but basally often ascending, branched above, with usually few (less often up to 20) obliquely upright branches terminating into one or many pedunculate capitula. Leaves lanceolate or linearly lanceolate, up to 7 cm long and 6 (less often 10) mm wide, sessile, gradually narrowed toward base, short, less often long-acuminate, three-veined (lateral veins sometimes visible only near base of lamina), punctately

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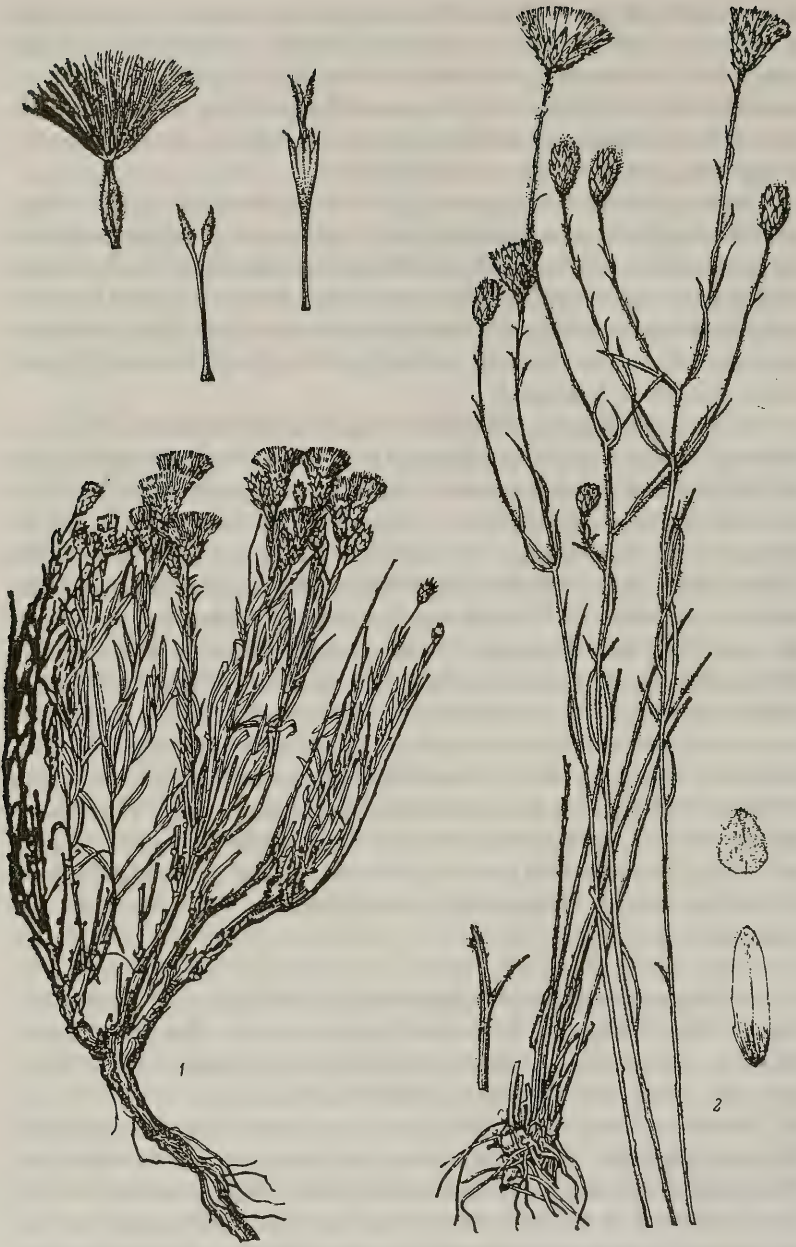
*Should be *G. chromopappa*, as originally Published Ed.



147 Plate XI.
1—*Pseudolinosyris grimmi* (Rgl. and Schm.) Novopokr., habit, achene, style, floret with style appendage; 2—*Galatella scoparia* (Kar. and Kir.) Novopokr., habit, part of peduncle with tomentose pubescence; involucral bract.

glandular on both sides, less often only above, dull green bracteal leaves (on inflorescence branches) highly reduced. Capitula in compact or lax corymbose inflorescence, sometimes solitary, medium, with 35–60 florets, 8–10(12) mm long and 12–16(20) mm wide (when flattened). Involucre broadly obconical to almost hemishperical, 5–7(8) mm long and 9–10(12) mm wide; involucral bracts herbaceous, greenish, at apex sometimes pinkish-violet, with narrowly membranous, more or less shortly tomentose-fimbriate margin, dorsally almost glabrous, three-veined, less often with one vein; outer bracts lanceolately ovate, acute; innermost bracts much larger, oblong, obtuse or subobtuse. Disk florets numerous, pale yellow, sometimes with pinkish-violet tinge; ligulate florets 8–16, pinkish (or bluish?)-violet; appendages of style branches two-thirds as long as branches. Achenes 3–4 mm long; pappus 7–8 mm long, entirely or partly with pinkish-violet tinge. Flowering VII–IX.

Highland steppes, rocky slopes, scrubs, forest edges; mainly in middle mountain zone. —*Soviet Central Asia*: Tien Shan (eastern part; ranges of the Ketmen, Tersk-Alatau, Kungei Alatau, Kirgiz Range), Pamiro-Alai (Alai Range). *General distribution*: Dzhungaria-Kashgaria. Described from the eastern Tien Shan (plateau between the Tekesa and Urta-Kakpak river valleys). Type in Leningrad.

Note. As compared to *C. macrosciadia*, it is a more southern but higher altitude race. I.V. Novopokrovsky, not altogether appropriately, selected the type of this species, which apparently, represents a not fully
150 typical specimen of *C. chromopappa* with very broad leaves, weak pubescence, very large capitula, and an almost colorless pappus. According to the original diagnosis of the author, it should have been referred to var. *obtusifolia* Novopokr. (l. c. 124) and to var. *macrocephala* Novopokr. (l. c. 126).

5. **G. villosula** Novopokr. in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, VII (1948) 127. —*G. chromopappa* Novopokr. ssp. *villosula* Novopokr. ibid. 127, in syn. —*Aster villosulus* Novopokr. ibid. 127, in syn. —**Ic.**: Novopokr. ibid. 133, Plate VII, Fig. 2.

Perennial. Plant 25–70 cm high, covered with very short papillose hairs and fine tomentose pubescence, mixed with (particularly along leaf margin) spinules, weakly scabrous. Stems solitary or few, erect, but basally often ascending, branched above with usually few (less often up to 15–20) obliquely upright branches terminating into one or many pedunculate capitula. Leaves lanceolate, oblongly lanceolate or linearly lanceolate, up to 6 cm long and up to 10 mm wide, sessile, gradually narrowed toward base, short, less often long acuminate, three-veined (lateral veins in middle and upper leaves often visible only near base of lamina), punctately glandular on both sides, less often only above, dull green, some bracteal leaves (on inflorescence branches) highly reduced. Capitula in compact, less often lax corymbose inforescence, sometimes solitary, medium, with 20–40 florets, 8–10 mm long and 12–15 mm wide (when flattened). Involucre broadly obconical to almost hemispherical, 4–6 mm long and 7–9 mm wide (when flattened); involucral bracts herbaceous, greenish (at apex often pinkish-violet), with narrowly membranous, more or less short tomentose-fimbriate margin, dorsally more or less covered with fine tomentum, or almost glabrous, three-veined, less often with one vein, veins not always distinct, outer bracts lanceolate, acute; innermost bracts larger, oblong, with broader membranous margin, obtuse or subobtuse. Disk florets rather numerous, pale yellow, often with pinkish-violet tinge; ligulate florets 7–10, pinkish-violet, appendages of style branches half to two-thirds as long as branches. Achenes 3.5–4.0 mm long; pappus 5.5–6.5 mm long, whitish, sometimes entirely or partly with pinkish-violet tinge. Flowering VII–IX.

Highland steppes, rocky slopes, scrubs, mainly in the middle mountain belt. —*Soviet Central Asia*: Tien Shan (western part: ranges of Talass Alatau, Fergana, and others.), Pamiro-Alai (Alai and Zeravshan ranges). *General distribution*: Dzhungaria-Kashgaria. Described from the western Tien Shan (Talass Alatau). Type in Leningrad.

Note. It replaces the previous species in the mountains of the western Tien Shan and Alai. The significant morphological similarity of *G.*
151 *villosula* with the Eurasian species *G. armena* and *G. sosnovskyana* should obviously be considered as convergent.

Series 2. Pallescentes Novopokr. in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, VII (1948) 118. — Capitula almost always without ligulate florets, broadly obconical, with 8–30 florets; plants covered with short papillose hairs and spinules, sometimes almost glabrous.

6. **G. biflora** (L.) Nees ab Esenb. Gen. et Sp. Aster (1833) 159; Novopokr. in Izv. Ross. Ak. Nauk, Ser. 6, XII (1918) 2272, p. p.; in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, VII (1948) 118 and in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XI (1949) 216; Krylov, Fl. Zap. Sib. XI, 2673, p. p. (excl. var. *subglabra* and ssp. *bipunctata*). —*G. dracunculoides* (Lam.) Nees ab Esenb. var. *discoidea* DC. Prodr. V. 256. —*G. punctata* (W. and K.) Nees ab Esenb. var. *discoidea* Avé-Lallem. in Ind. Sem. Hort. Petrop. VIII (1841) 61; Ldb. Fl. Ross. II, 479, p. p. (excl. *discoidea* minor). —*G. pallescens* Novopokr. op. cit. (1948) 118, in syn. —*G. biflora* (L.) Nees ab. Esenb. ssp. *krascheninnikovii* Novopokr. op. cit. (1948) 120 and (1949) 218. —*G. krascheninnikovii* Novopokr. op. cit. (1948) 120, in syn.— *G.*

novopokrovskii Zefir. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVIII (1957) 249. —*G. rigidula* Novopokr. ex Zefir. ibid. 249, in syn. —*Chrysocoma biflora* L. Sp. pl. (1753) 841. —*Ch. dracunculoides* Lam. Encycl. meth. II (1790) 192; M.B. Fl. taur.-cauc. II (1808) 288 and III (1819) 563. —*Aster bifidus* Nees ab Esenb. Synops. Aster (1818) 18. —*A. acer* var. *discoideus* Schmalh. Fl. Yugo-zap. Ross. (1886) 280 and Fl. II, 42. —*A. acris* var. *discoideus* Korsh. Tentam. fl. Ross. or. (1898) 204. —*A. sedifolius* var. *discoideus* Williams in Journ. of Bot. XLIII (1905) 87, p. p. —*A. krascheninnikovii* Novopokr. op. cit. (1948) 120, in syn. —*Crinitaria biflora* (L.) Cass. in Dict. sc. nat. XXXVII (1825) 476. —*Linosyris punctata* (Moench) DC. op. cit. 352, p. p. — **Ic.**: Gmel. Fl. sib. II (1749) tab. 82, fig. 1; Novopokr. op. cit. (1948) 125, Plate IV, Fig. 1; 129; Plate V, Fig. 2.

Perennial. Plant 25–80(100) cm high, covered with short papillose hairs and (particularly along leaf margin) spinules, weakly scabrous. Stems rather numerous, less often solitary, erect, branched above, with obliquely upright branches terminating into one or many pedunculate capitula. Leaves linearly lanceolate or linear, up to 8 cm long and 8 mm wide, sessile, gradually narrowed toward base, long-acuminate; except uppermost leaves three-veined (lateral veins sometimes visible only near base of lamina), punctately glandular or not, usually dull green; bracteal leaves (on inflorescence branches) highly reduced. Capitula in rather compact, less often lax corymbose inflorescence, with disk 8–11 mm long and 10–14 mm wide (when flat), with (5)8–20(25) florets. Involucre
152 broadly obconical, 3–5 mm long and 3.5–7.0 mm wide; involucral bracts herbaceous, greenish, with narrowly membranous, more or less short tomentose-fimbriate margin, dorsally almost glabrous, less often puberulent, three-veined, less often with one vein; outer bracts broadly lanceolate, acute; innermost bracts larger and brighter, oblong, obtuse or subacute. Disk florets pale yellow; ligulate florets usually absent, very rarely one to three(four), bright pinkish-violet; appendages of style branches as long as or up to two-thirds as long as branches. Achenes 3.5–4.5 mm long; pappus 5–6 mm long, whitish. Flowering VIII–IX.

Brackish and marshy meadows, low-lying meadows among steppes, scrubs, outcrops of chalk and limestone. —*European Part*: Volga-Kama (eastern part), Middle Dnieper (sporadically), Volga-Don (southern and eastern parts), Trans-Volga, Bessarabia, Black Sea Region, Lower Don, Lower Volga, Crimea; *Western Siberia*: Upper Tobol, Irtysh, Altai; *Eastern Siberia*: Angara-Sayans; *Soviet Central Asia*: Aralo-Caspian (northern and eastern parts); Balkhash Region (sporadically), Dzhungaria-Tarbagatai. *General distribution*: Dzhungaria-Kashgaria. Described from Siberia. Type in London.

Note. For a long time this species was considered as a non-ligulate (discoid) variety or a form of *G. punctata*. However, its independent status was confirmed by the following data: 1) Significant differences in the ecology of these two species: *G. biflora* is a plant of open brackish or marshy meadows, whereas *G. punctata* is a plant found in forests and scrubs in meadows only under conditions of weak salinity (generally in places where forests had been destroyed, in floodplains of rivers, etc.); 2) The areas of geographical distribution of both the species do not overlap: *G. punctata* spreads considerably farther in the north and west than *G. biflora*, whereas *G. biflora* spreads farther in the south; 3) Transitional specimens or populations with 1–4 ligulate florets in the capitulum are rare and possibly, they are a result of hybridization.

G. biflora varies considerably in the number of florets in the capitula, which generally is relatively constant for the given population. Populations with the least florets in the capitulum, the most common in western and southwestern parts of the range, perhaps are forming the weakly differentiated, separate ecogeographical race—*G. novopokrovskii* Zefir. (described from the Kerch Peninsula).

Populations from the southern border of the range of the species in Kazakhstan, often geographically isolated (as in the Chu River valley, Ulu-Tau Mountains and elsewhere), approach the following two species, possibly forming smaller separate races. The specimens referred by I.V. Novopokrovsky to ssp. *krascheninnikovii*, are, in our opinion, specimens of *G. biflora* from drier habitats, often those trampled by grazing cattle, and hardly deserve to be separated out as a separate taxonomic entity.

7. **G. trinervifolia** (Less.) Novopokr. in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, VII (1948) 121.—*G. glabra* Novopokr. in Fl. Yugo-Vost. 153 VI (1936) 314, Russk. Diagn.—*G. subglabra* Novopokr. op. cit. (1948) 120 and in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XI (1949) 219. —*G. biflora* (L.) Nees ab Esenb. var. *subglabra* (Novopokr.) Serg. in Krylov, Fl. Zap. Sib. XI (1949) 2673.—*Aster trinervifolius* Less. in Linnaea IX (1835) 183.—*A. glaberrimus* Novopokr. op. cit. (1936) 314, in syn.—*A. subglaber* Novopokr. op. cit. (1948) 120, in syn.—**Ic.**: Novopokr. op. cit. (1936) Fig. 667 and (1948) 119, Plate II, Fig. 2; 129, Plate V, Fig. 1.

Perennial. Plant 25–90 cm high, glabrous or subglabrous (only in inflorescence with short papillose hairs), but usually with fine, small spinules along leaf margin. Stems usually rather numerous, less often solitary, erect, branching above, with obliquely upright branches terminating into one or many pedunculate capitula. Leaves linearly lanceolate or linear, up to 8 cm long and 2.5–10.0 mm wide, sessile, gradually narrowed toward base, long-acuminate, less often short-acuminate, thick, three-veined (in middle and upper leaves lateral veins often visible only near base of lamina), punctately glandular above or not, dull green, bracteal leaves highly reduced. Capitula in compact or lax corymbose inflorescence with 10–20 florets, with disk 7–10 mm long and 8–12 mm wide (when flattened). Involucre broad, obconical, 3–5 mm long and 3.5–6.0 mm wide; involucral bracts herbaceous, greenish, almost glabrous, three-veined, less often with one; outer bracts lanceolately ovate, acute; innermost bracts larger, oblong, obtuse or subobtuse, with narrowly membranous margin. Disk florets pale yellow; ligulate florets usually absent, less often one to seven, bright pinkish-violet; appendages of style branches almost as long as branches. Achenes 3.5–4.5 mm long; pappus 5–6 mm long, whitish. Flowering VIII–IX.

Salt-marsh meadows, outcrops of chalk and limestone. —*European Part*: Trans-Volga (southern part), Lower Volga (northeastern part); *Western Siberia*: Upper Tobol (southern part); *Soviet Central Asia*: Aralo-Caspian (northern part). Endemic. Described from the vicinity of the city of Orenburg. Type in Leningrad.

Note. Only a few specimens of this species (including the type) preserved in the herbarium of the Botanical Institute of the Academy of Sciences of the USSR have ligulate florets. Although in other characters they are absolutely similar to the usual discoid specimens, it is not ruled out that they constitute a separate ecogeographical race —*G. trinervifolia* (Less.) Novopokr. sensu stricto, in contrast to the usual discoid race, which then should be called *G. subglabra* Novopokr. (described from the western Kazakhstan Province). At the northern boundary of the range, populations transitional to *G. biflora* apparently are found.

8. **G. regelii** Tzvel. nom. novum. —*C. chromopappa* Novopokr. f.
154 *discoidea* Novopokr. in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, VII (1948) 126. —*Linosyris punctata* Rgl. and Schmalh. in Acta Horti Petrop. V (1877) 613, non DC. (1836).

Perennial. Plant 25–50 cm high, covered with very short papillose hairs mixed with (particularly along leaf margin) spinules, somewhat scabrous. Stems rather numerous, basally ascending, erect above, branched above, with arcuately or obliquely upright branches terminating into one or many pedunculate capitula. Leaves linearly lanceolate or linear, sessile, gradually narrowed toward base, somewhat short-acuminate; except lowermost leaves (deciduous) only with one distinct vein, punctately glandular above (sometimes on both sides), dull green; bracteal leaves highly reduced. Capitula in very lax corymb, with 20–30 florets, 8–11 mm long and 12–16 mm wide (when flattened). Involucre broadly obconical, 4–5 mm long and 5–8 mm wide; involucral bracts greenish, with brighter, membranous, short tomentose-fimbriate margin, dorsally glabrous or subglabrous, one- or three-veined; outer bracts smaller, broadly lanceolate, acute; innermost bracts oblong, obtuse or subobtuse. Disk florets pale yellow; ligulate florets absent; appendages of style branches half to two-thirds as long as branches. Achenes 3.5–4.5 mm long; pappus about 6 mm long, whitish. Flowering VII–IX.

Salt-marsh meadows, solonetses. —*Soviet Central Asia*: Tien Shan (eastern part). *General distribution*: Probably Dzhungaria-Kashgaria. Described from the eastern Tien Shan (Tekes River valley). Type in Leningrad.

Note. I.V. Novopokrovsky referred specimens of this species to *G. chromopappa* [sic.] as a discoid form. However, in addition to the absence of ligulate florets, *G. regelii* is distinguished from *G. chromopappa* by having a very lax corymb, almost all leaves one-veined and an entirely different ecology. It is considerably closer to *G. biflora*.

Series 3. Obconicae Novopokr. in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, VII (1948) 118. — Capitulum always with ligulate florets, medium, obconical or broadly obconical, with 15–25 florets; plants covered with spinules and short papillose hairs, sometimes almost glabrous.

9. **G. punctata** (W. and K.) Nees ab Esenb. Gen. et Sp. Aster. (1833) 161; DC. Prodr. V, 255, p. p.; Ldb. Fl. Ross. II, 478 p. p.; Majevsk. Fl. Sr. Ross. (1892) 214; Pavlov, Fl. Tsentr. Kazakhst. III (1938) 221 p. p. —*G. punctata* (W. and K.) Nees ab Esenb. var. *densiflora* Avé-Lallem. in Ind. Sem. Hort. Petrop. VIII (1841) 60, p. p. — *? G. strigosa* Weinm. in Bull. Soc. Nat. Moscou XXIII (1850) 546. —*G. punctata* (W. and K.) Nees ab Esenb. ssp. *densiflora* (Avé-Lallem.) 155 Novopokr. and ssp. *baschkirica* Novopokr. in Fl. Yugo-Vost. VI (1936) 313. —*G. rossica* Novopokr. ssp. *densiflora* (Avé-Lallem.) Novopokr. in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, VII (1948) 121 and in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XI (1949) 213. —*G. densiflora* (Avé-Lallem.) Novopokr. op. cit. (1948) 121, in syn. —*G. ledebouriana* Novopokr. op. cit. (1948) 122 and (1949) 214. —*G. acutisquama* Novopokr. op. cit. (1948) 122, in syn. —*G. acutisquamoides* Novopokr. op. cit. (1948) 127, p. p. —*G. rossica* Novopokr. op. cit. (1949) 212; Krylov, Fl. Zap. Sib. XI, 2672. —*G. punctata* (W. and K.) Nees ab Esenb. ssp. *rossica* Novopokr. op. cit. (1949) 212, in syn. —*Aster punctatus* W. and K. Pl. rar. Hung. II (1805) 113, tab. 109. —*A. acer.* auct. non *A. acris* L.: Schmalh. Fl. II, 42, p. p. —*A. acris* var. *typicus* Korsh. Tentam. fl. Ross. or. (1898) 204. —*A. sedifolius* auct. non L.:

Syreistsch Ill. Fl. Mosk. Gub. (1906) 240; Fedtsch. and Fler. Fl. Evrop. Ross. (1910) 952. —*A. ledebourianus* Novopokr. op. cit. (1948) 122, in syn. —*A. rossicus* Novopokr. op. cit. (1949) 213, in syn. —*Galatea punctata* (W. and K.) Cass. Dict. sc. nat. XVIII (1820) 57. —**Ic.**: W. and K. op. cit. Rchb. Ic. Fl. Germ. XVI (1853) tab. 908; Syreistsch. op. cit. 240; Javorka and Csap. Ic. Fl. Hung. (1933) 509; Novopokr. op. cit. (1948) 117, Plate I, Fig. 2; 123, Plate III. —**Exs.**: Fl. exs. Austro-Hung. No. 3909; GRF Nos. 619 and 619a (under *Aster acer* var. *typicus* Korsh.).

Perennial. Plant 25–120 cm high, covered with very short papillose hairs and spinules, weakly scabrous. Stems rather numerous, less often solitary, erect, branched above, with obliquely upright branches terminating into one or many pedunculate capitula. Leaves linearly lanceolate or linear, up to 10 cm long and 8 mm wide, sessile, narrowed toward base, long-acuminate, three-veined; uppermost leaves, punctately glandular above, less often on both sides, green, bracteal leaves highly reduced. Capitula in rather compact, less often lax corymbose inflorescence, 7–12 mm long and 8–12 mm wide (when flattened), with 15–25 florets. Involucre broadly obconical, 3–6 mm long and 4–7 mm wide; involucral bracts greenish, with narrowly membranous, short tomentose-fimbriate margin, dorsally almost glabrous, three-veined, less often with one; outer bracts smaller, ovate-lanceolate, acute; innermost bracts larger, oblong, obtuse or subobtuse. Disk florets pale yellow, sometimes with pinkish-violet tinge; ligulate florets 5–10, pinkish-violet of different shades; appendages of style branches almost as long or two-thirds as long as branches. Achenes 3.5–4.5 mm long; pappus 4.5–6.0 mm long, whitish. Flowering VII–IX.

Scrubs, forests, floodplain meadows. —*European Part*: Dvina-Pechora (along Severnaya Dvina River), Upper Dnieper, Upper Volga (sporadically), Volga-Kama, Volga-Don, Trans-Volga, Bessarabia, Black Sea Region, Lower Don (sporadically), Lower Volga (northern part), Crimea (one doubtful reference); *Western Siberia*: Upper Tobol, Irtysh, Altai (western part); *Soviet Central Asia*: Dzhungaria-Tarbagatai, Tien Shan 156 (Trans-Ili Alatau and Kirgiz ranges). *General distribution*: Central Europe (southeastern part). Described from Hungary. Type in Budapest.

Note. I could not find any significant differences between specimens from the territory of the USSR and the Hungarian specimens of *G. punctata*, although I.V. Novopokrovsky refers them to a separate species—*G. rossica* (described from the vicinity of the city of Ufa). Moreover, the name *G. strigosa* Weinm. (described from Perm Province) should have had priority over the latter name. I also consider it futile to identify *G. ledebouriana* as a separate species, to which I.V. Novopokrovsky refers the smaller specimens of *G. punctata* from the drier habitats.

10. **G. coriacea** Novopokr. in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, VII (1948) 126.—*Aster coriacus* Novopokr. ibid. 126, in syn.—**Ic.**: Novopokr. Ibid. 135, Plate VIII, Fig. 1.

Perennial. Plant 25–80 cm high, glabrous or almost subglabrous, with insignificant mixture of very short papillose hairs, but scabrous due to spinules, particularly numerous along leaf margin. Stems solitary or few, erect, branched above, with obliquely upright branches terminating into many pedunculate capitula. Leaves lanceolate or linearly lanceolate, up to 8 cm long and up to 10–12 mm wide, sessile, narrowed toward base, short, less often long-acuminate, three-veined (lateral veins often not visible throughout), punctately glandular above or on both sides, dull green, stiff; bracteal leaves (on inflorescence branches) rather numerous, highly reduced. Capitula in compact, less often lax corymbose inflorescence, medium, with 16–28 florets, 8–10 mm long and 10–13 mm wide (when flat). Involucre broad-obconical, 4.5–7.0 mm long and 6–8 mm wide; involucral bracts almost coriaceous, greenish, with narrowly membranous, more or less tomentose-fimbriate margin, dorsally glabrous or subglabrous, with three, less often one, not always distinct veins; outer bracts lanceolately ovate, acute; innermost bracts larger, oblongly lanceolate; obtuse or subacute. Disk florets pale yellow; ligulate florets 5–10, pinkish-violet; appendages of style branches half to two-thirds as long as branches. Achenes 3.5–4.5 mm long; pappus 6–7 mm long, whitish, less often with pinkish-violet tinge. Flowering VII–IX.

Rocky slopes, scrubs, forest fringes; mainly in the lower montane zone.—*Soviet Central Asia*: Tien Shan (Trans-Ili Alatau, Karatau, Talass Alatau, Chatkal, Pskem, Fergana, and Kirgiz ranges), Syr-Darya, Pamiro-Alai (Alai, Turkestan, Zeravshan, Gissar, Karategin, Darvaz, Peter-the-First ranges). Endemic. Described from the southwestern Tien Shan. Type in Leningrad.

Note. It replaces *G. punctata* in the mountains of Central Asia. Specimens from the southern part of its range (Darvaz and Peter-
157 the-First ranges) are distinguished by short-acuminate, entire leaves and possibly, represent a separate ecogeographical race annotated in the herbarium by I.V. Novopokrovsky as *"G. obtusifolia* Novopokr."

I reproduce here the label of the type specimen, which was not given in the original description: Former Andizhan district, beginning of the climb toward Kuldun Pass, No. 845, 15, VIII, 1911, O.E. Knorring and Z.A. Minkwitz.

11. **G. fastigiiformis** Novopokr. in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, VII (1948) 128. —*G. acutisquamoides* Novopokr. ibid. 127, p. p. —*G. acutisquamoides* Novopokr. ssp. *fastigiiformis* Novopokr. ibid. 128, in syn. and ssp. *montana* Novopokr. Ibid 117, nom. nud. —*Aster acutisquamoides* Novopokr. ibid. 127, in syn. —*A. fastigiiformis* Novopokr. ibid. 128, in syn. —**Ic.**: Novopokr. ibid. 117, Plate I, Fig. 1; 119, Plate II, Fig. 1; 147, Plate XI, Fig. 1.

Perennial. Plant 25–100(120) cm high, covered with very short, but dense papillose hairs mixed with (particularly along leaf margin) spinules. Stems solitary or few erect, branched above, with arcuately or obliquely upright, often flexuous branches terminating into one or many pedunculate capitula. Leaves linearly lanceolate or linear, up to 8 cm long and 0.6 mm wide, sessile, gradually narrowed toward base, with long, less often short, rarely long-acuminate, three-veined (lateral veins often not distinct throughout), punctately glandular above, less often on both sides (sometimes not) dull green, bracteal leaves (on inflorescence branches) highly reduced. Capitula in relatively lax corymbs, quite small, with 14–25 florets, 7–10 mm long and 7–12 mm wide (when flattened). Involucre obconical, 3–5 mm long and 5–6 mm wide; involucral bracts herbaceous, bright yellowish-green, with narrowly membranous short tomentose-fimbriate margin, with one or three much darker, greenish veins; outer bracts ovately lanceolate, acute, dorsally more or less pubescent; innermost bracts much larger, oblongly lanceolate, obtuse or subacute, dorsally glabrous or subglabrous. Disk florets pale yellow; ligulate florets four to eight, bright pinkish-violet; appendages of style branches two-thirds as long as branches. Achenes 3.5–4.5 mm long; pappus 5–6 mm long, whitish, often entirely or partly with pinkish-violet tinge. Flowering VII–IX.

Floodplain, often marshy meadows, scrubs, damp sandy places; up to lower montane zone. —*Soviet Central Asia*: Dzhungaria-Tarbagatai (foothills of the Dzhungarian Alatau), Balkhash Region (southern part), Aralo-Caspian (southeastern part), Syr-Darya, Tien Shan. *General distribution*: Dzhungaria-Kashgaria. Described from southeastern Kazakhastan (the former Dzharkent district). Type in Leningrad.

Note. G. acutisquamoides was described by I.V. Novopokrovsky from specimens seemingly intermediate between *G. fastigiiformis* and
158 *G. punctata*. We refer a considerable portion of the specimens with the more compact inflorescence and an almost glabrous involucre to *G. punctata*, while the remaining specimens (including the type of *G. acutisquamoides* also from southeastern Kazakhstan) can be united entirely with *G. fastigiiformis*. Specimens from the Chatkal and other adjoining ranges of the Tien Shan approach *G. punctata*, possibly representing a separate ecogeographical race.

12. **G. hissarica** Novopokr. in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, VII (1948) 128. —*Aster hissaricus* Novopokr. ibid. 128, in syn.

Perennial. Plant 40–80 cm high, covered with very short, papillose hairs, mixed (particularly along leaf margin) with spinules, weakly scabrous. Stems solitary or few, erect, branched above, with obliquely upright branches terminating into one or many pedunculate capitula. Leaves oblongly or linearly lanceolate, up to 8 cm long and 0.7 cm wide, sessile, gradually narrowed toward base, short (usually much lower leaves) or very long-acuminate, three-veined (lateral veins often not distinct throughout), punctately glandular on both sides, green; bracteal leaves (on inflorescence branches) highly reduced, passing over to involucral bracts. Capitula in lax or rather compact corymbs, relatively small, with 14–20 florets, with disk 8–9 mm long and 7–9 mm wide (when flattened). Involucre obconical, 5–7 mm long and 5–7 mm wide; involucral bracts bright yellowish-green, with one, less often three much darker veins, with narrowly membranous short tomentose-fimbriate margin, dorsally puberulent to subglabrous; outer bracts lanceolate, gradually acuminate, innermost bracts much longer, linearly lanceolate, acute or subacute. Disk florets pale-yellow; ligulate florets 4–8, bright pinkish-violet, appendages of style branches two-thirds as long as branches. Achenes 3–4 mm long; pappus 7–8 mm long, whitish, often entirely or partly with pinkish-violet tinge. Flowering VII–IX.

Scrubs, rocky slopes; up to middle montane zone. —*Soviet Central Asia*: Pamiro-Alai. Endemic. Described from the Gissar Range. Type in Leningrad.

Note. It occupies, in effect, an intermediate position between *G. fastigiiformis* and *G. litvinovii*. Its separate status needs to be confirmed through a study of much more material.

13. **G. litvinovii** Novopokr. in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, VII (1948) 130.—*Aster litvinovii* Novopokr. Ibid. 130, in syn.—**Ic.**: Novopokr. Ibid. 147, Plate XI, Fig. 2.—**Exs.**: P. Sintenis, Iter transcasp.-pers., No. 1001 (under *G. punctata* var. *discoidea* Avé-Lallem.).

Perennial. Plant 40–100 cm high, covered with very short papillose
159 hairs and (particularly along leaf margin) spinules, weakly asperate. Stems solitary or numerous, erect, branched above, with obliquely upright branches terminating into many pedunculate capitula. Leaves oblong or linearly-lanceolate, up to 8 cm long and 8 mm wide, sessile, gradually narrowed toward base, long or short-acuminate (particularly much lower leaves), three-veined (lateral veins often not distinct throughout), punctately glandular on both sides, green; bracteal leaves (on inflorescence branches) highly reduced. Capitula in lax, less often rather compact corymbs, relatively small, with 14–20 florets, 8–10 mm long and

7–9 mm wide (when flattened). Involucre obconical, 5–7 mm long and 5–7 mm wide; involucral bracts bright yellowish-green, with darker, greenish midrib and narrowly membranous, short-tomentose-fimbriate margin, dorsally almost glabrous; outer bracts lanceolate, gradually acuminate, sometimes cuspidate; innermost bracts longer, linearly lanceolate, acute, often three-veined. Disk florets pale yellow; ligulate florets 4–8, bright pinkish-violet; appendages of style branches half to two-thirds as long as branches. Achenes 3–4 mm long; pappus 6–7 mm long, whitish. Flowering VII–IX.

In mountain ravines on banks of rivers and streams, in scrubs; up to middle montane zone.— *Soviet Central Asia*: mountainous Turkmenia, Pamiro-Alai (Zeravshan Range). Endemic. Described from Kopetdag. Type and isotype in Leningrad.

Note. Specimens from the Zeravshan Range approach *G. hissarica*.

14. **G. pastuchovii** (Kem.-Nat.) Tzvel. comb. nova. —*G. dracunculoides* (Lam.) Nees ab Esenb. var. *pastuchovii* Kem.-Nat. in Vestn. Tifl. Bot. Sada, 3–4 (1927) 132; Grossh. Fl. Kavk. IV, 94. —*G. punctata* (W. and K.) Nees ab. Esenb. var. *lallemantii* Novopokr. in Fl. Yugo-vost. VI (1936) 313, Russk. Diagn.; Grossh. Opredel. Rast. Kavk. (1949) 441.

Perennial. Plant 25–80 cm high, covered with very short papillose hairs and (particularly along leaf margin) spinules, somewhat scabrous. Stems solitary or few, erect, branched above, with arcuately and obliquely upright, often flexuous branches terminating into one or many pedunculate capitula. Leaves linearly lanceolate or linear, up to 8 cm long and 8 mm wide, sessile, narrowed toward base, short, less often long-acuminate, three-veined (lateral veins often not distinct throughout), punctately glandular above, less often on both sides, (sometimes not), dull green; bracteal leaves (on inflorescence branches) highly reduced. Capitula in lax corymbs, relatively small, with 14–20 florets, 7–10 mm long and 8–12 mm wide (when flattened). Involucre broadly obconical, 3.5–5.0 mm long and 4–6 mm wide; involucral bracts bright
160 yellowish-green, with narrow membranous, short tomentose-fimbriate margin, dorsally almost glabrous, with one, less often three, darker, greenish veins; outer bracts ovately lanceolate, acute; innermost bracts longer, oblongly lanceolate, obtuse or subobtuse. Disk florets pale yellow; ligulate florets 4–8 (10), bright pinkish-violet, appendages of style branches half to two-thirds as long as branches. Achenes 3.0–4.5 mm long; pappus 5–6 mm long, whitish. Flowering VII–IX.

Floodplains, often marshy brackish meadows, scrubs, steppe slopes, particularly on standy soils. —*European Part*: Lower Don (eastern part), Lower Volga; *Caucasus*: Dagestan, eastern Transcaucasia (northeastern part). Endemic. Described from region of city of Kuba of Azerbaizhan SSSR. Type in Tbilisi.

Note. Like *G. fastigiiformis* it replaces *G. punctata* in the semi-desert and desert zone, but has a more western range.

15. **G. eldarica** Kem.-Nat. in Fl. Gruzii VIII (1952) 241, Gruz. diagn.— **Ic.**: Kem.-Nat. ibid. Plate 380.

Perennial. Plant 60–80 cm high, covered with very short papillose hairs, and insignificant mixture of spinules, somewhat scabrous. Stems solitary or few, erect, branched above, with obliquely upright branches terminating into one or many pedunculate capitula. Leaves linear or linearly-lanceolate, up to 5 cm long and 0.6 cm wide, sessile, gradually narrowed toward base, short-acuminate, three-veined (lateral veins usually not distinct except near base of lamina), punctately-glandular on both sides, or only above, dull green; bracteal leaves (on inflorescence branches) rather numerous, highly reduced. Capitula in lax corymbs, rather small, with 8–12 florets, 8–9 mm long and 5–6 mm wide (when flattened). Involucre obconical, about 5 mm long and 4–5 mm wide; involucral bracts dorsally subglabrous; along margin very short tomentose-fimbriate, with three, less often some of them with one vein; outer bracts ovately-lanceolate, acute; innermost bracts oblong, larger, acute or obtuse. Disk florets pale yellow; ligulate florets four to six, bright pinkish-violet. Flowering VIII–X.

Steppes. —*Caucasus*: Eastern Transcaucasia (western part). Endemic. Described from Western Georgia (Eldar steppe). Type in Tbilisi.

Note. The description was prepared from a translation of the original Georgian diagnosis of the species and a fragment of the type specimen kindly sent to us by L.M. Kemularia-Nathadze and A.L. Charadze from Tbilisi. The narrow, long-acuminate leaves and the involucral bracts with three veins place this species close to *G. punctata*, while in the number of florets in the capitulum it shows considerable similarity with *G. dracunculoides*, occupying, in effect, an intermediate position between these species.

161 *Series* 4. Armenae Tzvel. —Capitula always with ligulate florets, medium, broadly obconical, with 15–25 florets; plants covered with very short, papillose hairs and very fine (hardly noticeable without magnifying glass) tomentum with mixture of spinules.

16. **G. sosnovskyana** Kem.-Nat. in Vestn. Tifl. Bot. Sada. 3–4 (1927) 137; Grossh. Fl. Kavk. IV, 95. —*G. armena* auct. non Boiss.: Novopokr. in Izv. Ross. Ak. Nauk. Ser. 6, XII (1918) 2269; Grossh. Opredel. Rast. Kavk. (1949) 441. —*G. armena* Boiss. var. *caucasica* Kem.-Nat. op. cit. 136; Grossh. Fl. Kavk. IV, 95.

Perennial. Plant 25–100 cm high, covered with very short, papillose hairs with mixture of spinules and very fine arachnoid tomentum. Stems solitary or few, erect, branched above, with obliquely upright branches terminating into one or many pedunculate capitula. Leaves oblong or linearly-lanceolate, up to 8 cm long and 1 cm wide, sessile, narrowed toward base, short-acuminate, three-veined (lateral veins not distinct throughout), punctately glandular above, less often on both sides, dull green; bracteal leaves (on inflorescence branches) highly reduced. Capitula in compact or lax corymbs, medium, with 15–25 florets, with disk 7–9 mm long and 8–12 mm wide (when flattened). Involucre broadly obconical 3.5–5.0 mm long and 5–7 mm wide; involucral bracts greenish, with narrowly membranous, short tomentose-fimbriate margin, dorsally pubescent with papillose hairs and tomentum to almost glabrous, with three (less often one) veins; outer bracts ovate or lanceolately ovate, acute; innermost bracts longer, oblong, obtuse. Disk florets pale yellow, often with pinkish-violet tinge; ligulate florets 5–12, pinkish-violet; appendages of style branches half to two-thirds as long as branches. Achenes 3–4 mm long; pappus 5–6 mm long, whitish. Flowering VIII–IX.

Scrubs, rocky slopes; up to middle montane zone. —*Caucasus*: Southern Transcaucasia, western Transcaucasia (southern part), *General distribution*: Armenia and Kurdistan. Described from Armenia (Lake Sevan region). Type in Tbilisi.

Note. The specimens of this species are distinguished from the isotypes of *G. armena* Boiss. (Kotschy, *Iter Cil.- Kurd.* 1859, No. 398) preserved in the herbarium of the Botancial Institute of the Academy of Sciences of the USSR by capitula with a larger number of florets (14–18 and not 8–14 disk florets), leaves punctate with numerous glands and weakly pubescent involucral bracts. To this species we refer *G. armena* Boiss. var. *caucasica* Kem.-Nat., also described by L.M. Kemularia-Nathadze. The differences of the latter from *G. sosnovskyana* are not clear from the original diagnosis of the authors and do not seem very substantial to us.

Series 5. Dracunculoideae Novopokr. in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, VII (1948) 122. —Capitula always with ligulate florets, 162 rather small, obconical, with 6–15 florets; plants covered with very short, papillose hairs and mixture of spinules, somewhat scabrous.

17. **G. dracunculoides** (Lam.) Nees ab Esenb. Gen. et sp. Aster. (1833) 164; DC. Prodr. V, 256, p. p.; Novopokr. in Izv. Ross. Ak. Nauk. Ser. 6, XII (1918) 2271 and Fl. Yugo-Vost. VI, 319; Grossh. Fl. Kavk. IV, 94. —*G. punctata* (W. and K.) Nees ab Esenb. var. *dracunculoides*

(Lam.) Avé-Lallem. in Ind. Sem. Hort. Petrop. VIII (1841) 60; Ldb. Fl. Ross. II, 479.—*G. iberica* (Kem.-Nat.) Kem.-Nat. in Fl. Gruz. VIII (1952) 235, Gruz. diagn. —*Aster dracunculoides* Lam. Encycl. meth. I (1780) 303; M.B. Fl. taur.-cauc. II, 310 and III, 572. —*A. acer* auct. non *A. acris* L.: Schmalh. Fl., II, 42, p. p.—*A. sedifolius* var. *dracunculoides* (Lam.) Williams in Journ. of Bot. LXIII (1905) 86, p. p. —*Galatea pauciflora* Cass. in Dict. sc. nat. XVIII (1820) 56. — **Ic.**: Novopokr. op. cit. (1936) Fig. 666; Kem.-Nat. op. cit. Plate 379. **Exs.**: Herb. Fl. Cauc. No. 350.

Perennial. Plant 25–100 cm high, covered with very short, papillose hairs and mixture (particularly along the leaf margin) of spinules, somewhat scabrous. Stems solitary or few, erect, branched above with obliquely upright branches terminating into one or many pedunculate capitula. Leaves oblongly lanceolate or linearly lanceolate, up to 8 cm long and 12 mm wide, sessile, narrowed toward base, very short-acuminate (lower leaves sometimes obtuse), three-veined, punctately glandular above, less often on both sides, often not so, dull green; bracteal leaves (on inflorescence branches) highly reduced. Capitula in compact, less often lax corymbs inflorescence, rather small, with 6–15 florets, 6–9 mm long and 7–10 mm wide (when flattened). Involucre obconical, 4–5 mm long and 4–6 mm wide; involucral bracts usually entirely greenish-white, with greenish midrib and narrowly membranous, short tomentose-fimbriate margin, less often only some with such margin, three-veined, dorsally subglabrous; outer bracts broadly lanceolate, acute; innermost bracts larger, oblong, subacute or subobtuse. Disk florets not many, pale yellow, often pinkish-violet tinge; ligulate florets three to six, pinkish-violet of different tinges; appendages of style branches half to two-thirds as long as branches. Achenes 3–5 mm long; pappus 5–7 mm long, whitish. Flowering VIII–IX.

Scrubs, forest edges, steppe slopes, limestones and chalk beds. — *European Part*: Middle Dnieper (sporadically), Volga-Don (southern part), Trans-Volga (in the region of the city of Uralsk), Black Sea Region, Lower Don, Lower Volga (northwestern part), Crimea; *Caucasus*: Ciscaucasia, Dagestan (sporadically), eastern Transcaucasia, western
163 Transcaucasia. *General distribution*: Asia Minor, Armenia and Kurdistan. Described from garden specimens, apparently, from the Caucasus. Type in Paris.

Note. In Crimea and the Caucasus there is dominance of specimens with punctate glands on leaves, whereas in specimens from the south of the European Part of the USSR the glands, as a rule, are lacking. Maybe on this basis I should identify two poorly demarcated ecogeographical races— the southern and northern races. However, due to nonavailability of the type material of *G. dracunculoides* it is not clear which of them should be named after Lamarck. On the basis of specimens from the vicinity of the city of Tbilisi, with numerous glands on both sides of the leaves, *G. iberica* has been described, which was initially described by L.M. Kemularia-Nathadze as *G. dracunculoides* var. *iberica* Kem.-Nat. in *Vestn. Tifl. Bot. Sada*, No. 3–4 (1927) 135. Among other varieties of *G. dracunculoides* mentioned by L.M. Kemularia-Nathadze from the Caucasus, we consider that "var. *pastuchovii* Kem.-Nat. ibid. 132" var. *schelkovnikovii* Kem.-Nat. ibid. 133" and "var. *latifolia* Kem.-Nat. ibid. 135" hardly deserve special taxonomic status, and, so far as "var. *troitzkyi* Kem.-Nat. ibid. 133" and "var. *falcata* Kem.-Nat. ibid. 134" are concerned, we find it difficult to express any definite opinion as we do not have any herbarium material of them.

Section 2. XYLOGALATELLA Novopokr. in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, VII (1948) 132. —Capitula few in lax corymb or solitary, always with ligulate florets; usually all or some corymb branches arcuate. Involucre broadly obconical; outer involucral bracts lanceolate. Leaves rather numerous, very small, covered with punctate glands. Stems numerous, basally woody, short (20–30 cm high); plants almost glabrous. A monotypic section.

18. **G. saxatilis** (M. Pop. ex Novopokr.) Novopokr. in Tr. Bot. Inst. Akad Nauk SSSR, Ser. 1, VII (1948) 132. —*Aster saxatilis* (M. Pop. ex Novopokr.) Novopokr. ibid. 132, in syn. —*A. acer* var. *saxatilis* M. Pop. ex Novopokr. ibid. 132, in syn.

Perennial. Plant 20–30 cm high, almost glabrous except somewhat arachnoid-tomentose stem. Stems numerous, basally woody, erect, branched above, with few (one to four) arcuately or obliquely upright branches terminating into single capitulum on rather long peduncle, often simple. Leaves rather numerous, linearly lanceolate, very small (middle cauline leaves 1.5 cm long and 2.0–2.5 mm wide), sessile, acute, stiff, glandular on both sides or only above; bracteal leaves highly reduced, usually 5–10 on inflorescence branches. Capitula in lax corymb or solitary, medium. Involucre about 5 mm long and 8–10 mm
164 wide (when flattened); involucral bracts almost equal, greenish, apically often with pinkish-violet tinge, with narrow, white, membranous margin; outer bracts lanceolate, acute; innermost bracts oblong, obtuse. Disk florets numerous, pale yellow; ligulate florets also numerous, pinkish-violet (?). Achenes pubescent; pappus whitish. Flowering VII–IX.

Rocks, stony slopes. —*Soviet Central Asia*: Tien Shan (Ketmen Mountains). Endemic. Described from Ketmen Mountains. Type in Leningrad (?) or Alma-Ata.

Note. We have not seen the specimens of this species, and the description was prepared from the original diagnosis of the author.

Section 3. Oreophilon Novopokr. in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, VII (1948) 130. —Capitula not numerous, in corymbose inflorescence or solitary, always with ligulate florets; peduncles of capitula usually straight. Involucre almost hemispherical; outer bracts lanceolate, acute. Leaves without punctate glands, all one-veined (very-rarely lowermost bracts with weak lateral veins). Stems basally ascending; almost glabrous, up to 60 cm high plants.

Lectotype of section: *G. tianschanica* Novopokr.

19. **G. tianschanica** Novopokr. in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, VII (1948) 130. —*Aster tianschanicus* Novopokr. ibid. 130.

Perennial. Plant 25–60 cm high, more or less very finely arachnoid tomentose above, later almost glabrous. Stems rather numerous, less often solitary, basally ascending, erect above, but often arcuate, branched above, with few (one to eight) obliquely upright branches terminating into single capitulum. Leaves linear (lowermost leaves often linearly lanceolate), 2.5 cm long and 1.5–4.0 mm wide, crowded mainly in lower half of stem and often on one side, sessile, gradually narrowed toward base, short-acuminate, somewhat thick, with indistinct midrib, without punctate glands, pale green, some bracteal leaves highly reduced, often involute. Capitula in lax corymbs or solitary, medium, with 50–80 florets, 8–10 mm long and 15–22 mm wide (when flattened). Involucre almost hemispherical, 5–7 mm long and 10–12 mm wide; involucral bracts herbaceous, greenish, with much brighter, short tomentose-fimbriate margin, at apex sometimes pinkish-violet, dorsally more or less arachnoid-pubescent to almost glabrous, with three, rarely some with one or five, somewhat indistinct veins; outer bracts lanceolate, long-acuminate or cuspidate; innermost bracts longer, oblongly linear, short-acuminate or subobtuse. Disk florets numerous, pale yellow; ligulate florets 15–20, bright pinkish-violet; appendages of style branches one-third to half as long as branches. Achenes (not fully mature) 165 2.5–3.5 mm long; pappus 5–6 mm long, whitish. Flowering VII-IX (Plate XII, Fig. 2).

Solonetses, rubbled slopes, up to the lower montane zone. —*Soviet Central Asia*: Tien Shan (eastern part, in Tekes and Kegen river valleys). *General distribution*: Probably, Dzhungaria-Kashgaria. Described from eastern Tien Shan (between Ketmen and Terskei-Alatau ranges). Type in Leningrad.

Note. I cite here the corrected label of the type (as labels of two specimens were mixed up in the original description of the species):

Former Dzharkent district, Solonets soil at the Kegen postal station, No. 2153, 18.VII.1910. A.I. Michelson.

20. **G. polygaloides** Novopokr. in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, VII (1948) 132. —*Aster polygaloides* Novopokr. ibid. 132, in syn.

Perennial. Plant 10–15 cm high, almost glabrous (with inconspicuous) mixture of very fine arachoid-tomentum in inflorescence). Stems rather numerous, less often solitary, basally ascending, erect, but often arcuate, simple or branched above, with few (one to four) obliquely upright branches terminating into single capitulum. Leaves lanceolate or linearly-lanceolate; middle and lower leaves 2–4 cm long and 2–4 cm wide, often on one side, sessile, gradually narrowed toward base, short-acuminate, one-veined (lowermost leaves sometimes with weak lateral veins), without punctate glands, green, few bracteal leaves highly reduced. Capitula solitary or one to four, medium, with 40–70 florets, 8–9 mm long and 14–19 mm wide (when flatttened). Involucre almost hemispherical, 4–5 mm long, and 8–10 mm wide; involucral bracts herbaceous, greenish, with narrowly membranous, short tomentose-fimbriate margin, dorsally glabrous or subglabrous, three-veined or some with one indistinct vein; outer bracts lanceolate, acute, innermost longer, oblongly linear, obtuse or subobtuse. Disk florets numerous, pale yellow; ligulate florets 10–18, bright bluish-violet; appendages of style branches one-third to half as land as branches. Achenes (not fully mature) 3.0–3.5 mm long; pappus 5–6 mm long, whitish. Flowering VIII–IX.

Rocky slopes, thinned-out forests; mainly in the middle montane zone.—*Soviet Central Asia*: Tien Shan (Ketmen Mountains). Endemic. Described from the Ketmen Mountains. Type in Leningrad.

Section 4. FASTIGIATAE Novopokr. in Izv. Ross. Akad. Nauk, Ser. 6, XII (1918) 2280, 2282. —Sect. *Mastigopus* Novopokr. in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, VII (1948) 134 and in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XI (1949) 224. —Capitula usually few, with or without ligulate florets, aggregated into lax corymb, less often solitary; 166 branches of corymb and peduncles of capitula usually partially arcuate. Involucre broadly obconical; outer involucral bracts ovately lanceolate. Leaves without punctate glands, lower leaves (sometimes fugaceous) three-veined; middle and upper leaves usually one-veined; plant 30–40, less often up to 50–60 cm high, almost glabrous or finely tomentose.

Lectotype of section: *H. hauptii* (Ldb.) Lindl. = *G. fastigiata* (Lehm.) ex Nees ab Esenb.) Nees ab Esenb.

Note. Like the previous section it occupies a very isolated position in the genus, approaching closely to *Aster* L. (through *G. divaricata*, in which the ligulate florets are often fertile and fruiting) and to section *Crinitaria* of the genus *Linosyris* (through *G. scoparia,* in which ligulate florets are always absent and almost all leaves are one-veined). I.V. Novopokrovsky unites the species of this section in the USSR into one series, the *Astigmae* Novopokr. op. cit. (1948) 134, distinguishing them from the species of Western Europe. In my opinion, it is not possible to agree to such a conclusion.

Series 1. Angustissimae Tzvel.—Capitula always with ligulate florets; plants almost glabrous.

21. **G. hauptii** (Ldb.) Lindl. in DC. Prodr. V (1836) 256; Ldb. Fl. Ross. II, 481, p. p.; Kryl., Fl. Zap. Sib. XI, 2675, p. p. *G. fastigiata* (Lehm. ex Nees ab Esenb.) Nees ab Esenb. Gen. et sp. Aster (1833) 169; DC. op. cit. 256; Novopokr. in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, VII (1948) 134 and in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XI (1949) 224.—*G. squamosa* DC. op. cit. 257.—*G. hauptii* (Ldb.) Lindl. var. *grandiflora* Avé-Lallem. in Ind. Sem. Hort. Petrop. VIII (1841) 58 and var. *squamosa* (DC.) Avé-Lallem. ibid. 59.—*G. angustissima* (Tausch) Novopokr. var. *squamosa* (DC.) Novopokr. op. cit. (1948) 137 and (1949) 227, p. p.—*Aster fastigiatus* Ldb. Icon. pl. fl. ross. impr. alt. II (1830) 19, tab. 161, non Fisch., 1812.—*A. hauptii* Ldb. Fl. alt. IV (1833) 100; Schmalh. Fl. II, 42, p. p.—*A. fastigiatus* Lehm. ex Nees ab Esenb. op. cit. 169, in syn., non Fisch. (1812), non Ldb. (1830).—*A. caroli ledebourii* Novopokr. op. cit. (1948) 134, in syn. **Ic.**: Ldb. op. cit. (1830) tab. 161; Novopokr. op. cit. (1948) 139; Plate IX, Fig. 2.—**Exs.**: P. Smirnov. Pl. alt. exs. No. 85 (under *G. fastigiata*).

Perennial. Plant 10–50 cm high, glabrous or subglabrous, but usually somewhat scabrous because of spinules mainly along leaf margin. Stems one or few, erect, but basally often ascending, branched above, with few arcuately and obliquely upright branches terminating into one, less often two or three pedunculate capitula, sometimes simple. Leaves sessile, gradually narrowed toward base, short-acuminate, without punctate glands, green; lower and often also middle leaves oblong, three-veined (some five-veined), upto 5–6 mm wide; middle leaves oblongly or
167 lanceolately linear, 2–7 cm long and 2–3 mm wide, one- to three-veined; upper leaves usually linear, one-veined; bracteal leaves rather numerous, highly reduced. Capitula not numerous, in lax corymbs, often solitary, with many florets (up to 60 in one capitulum), 8–15 mm long. Involucre broadly obconical, 6–9 mm long and 9–14 mm wide;

involucral bracts herbaceous, pale green, often at tip pinkish-violet, along margin narrowly membranous and short, tomentose-fimbriate, dorsally almost glabrous, with one thick vein; outer bracts ovately lanceolate, acute; innermost bracts longer and brighter, obtuse or subobtuse, often three-veined. Disk florets pale yellow, often with pinkish-violet tinge; ligulate florets 8–15, pinkish-violet; appendages of style branches half to two-thirds as long as branches. Achenes 3.5–5.0 mm long; pappus 5–7 mm long, whitish. Flowering VII–IX.

Steppes, rocky slopes, scrubs, mainly in middle montane zone. — *Western Siberia*: Irtysh (eastern part), Altai; *Soviet Central Asia*: Dzhungaria-Tarbagatai. *General distribution*: Probably, Mongolia (northwestern part). Described from the Altai. Type and isotype in Leningrad.

Note. In comparison with *G. angustissima* it is a more alpine species and, apparently, connected with it by intermediate populations.

22. **G. angustissima** (Tausch) Novopokr. in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, VII (1948) 136 and in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XI (1949) 226. —*G. tenuixolia* Lindl. in DC. Prodr. V (1836) 257. —*G. hauptii* (Ldb.) Lindl. var. *tenuifolia* (Lindl.) Avé-Lallem. in Ind. Sem. Hort. Petrop. VIII (1841) 59; Ldb. Fl. Ross. II, 481; Krylov, Fl. Zap. Sib. XI, 2676. —*G. desertorum* (Less.) Kar. and Kir. Enum. Pl. Song. (1842) 107.—*G. fastigiata* (Lehm. ex Nees ab Esenb.) Nees ab Esenb. var. *tenuifolia* (Lindl.) Novopokr. in Fl. Yugo-vost. VI (1936) 315. —*G. fastigiata* auct. non Nees ab Esenb.: Grossh. Opredel. Rast. Kavk. (1949) 441. —*Aster angustissimus* Tausch in Flora XI (1828) 487. —*A. leptophyllus* Fisch. Cat. Horti Gorenk. ed. 2 (1812) 39, nom. nud. —*A. hauptii* Ldb. var. *tenuifolius* (Lindl.) Schmalh. Fl. II (1897) 42. —*Gelasia disertorum* Less. in Linnaea IX (1835) 185. — **Ic.:** Novopokr. op. cit. (1948) 139, Plate IX, Fig. 1. —**Exs.**: GRF No. 2764 (under *G. fastigiata* var. *grandiflora*), No. 2765 a and b (under *G. fastigiata* var. *tenuifolia*), No. 3492 a and b (under *G. angustissima* var. *tenuifolia*).

Perennial. Plant 10–50 cm high, glabrous or subglabrous (with very weak arachnoid pubescence), but usually with small spinules along leaf margin. Stem solitary or few, erect, but often ascending at base, branched above, with arcuately or obliquely upright branches terminating into one, less often two or three capitula on long peduncles. Leaves sessile, gradually narrowed toward base, acuminate, without punctate glands, green; lower leaves linear or linearly lanceolate, 3–4 mm wide; three-
168 veined; middle and upper leaves usually narrowly linear, 2–7 cm long and 1–2 mm wide, one-veined; bracteal leaves (on inflorescence branches) rather numerous, highly reduced. Capitula in lax corymbs, with 20–50 florets, 8–11 mm long. Involucre broadly obconical, 5–7 mm long and

8–12 mm wide; involucral bracts herbaceous, pale green, often pinkish at tip, narrowly membranous and short, tomentose-fimbriate, along margin, dorsally almost glabrous, with one (innermost bracts sometimes with three) thick vein; outer bracts ovately lanceolate, acute; innermost bracts longer and oblongly lanceolate, obtuse or subobtuse. Disk florets pale yellow, sometimes with pinkish tinge; ligulate florets 5–15, pinkish-violet of different shades; appendages of style branches two-thirds as long as branches. Achenes 3.5–5.0 mm long; pappus 5–7 mm long, whitish. Flowering VII–IX.

Steppes, rocky slopes, scrubs, sometimes in pinewoods.—*European Part*: Volga-Kama, Volga-Don (sporadically), Trans-Volga, Lower Don (sporadically), Lower Volga; *Caucasus*: Ciscaucasia(?); *Western Siberia*: Ob Region (southern part), Upper Tobol-Irtysh, Altai; *Eastern Siberia*: Yenisei (southern part). Angara-Sayans; *Soveit Central Asia*: Balkhash Region (eastern part), Dzhungaria-Tarbagatai. *General distribution*: Mongolia (northwestern part). Described from Siberia. Type in Leipzig or Prague(?).

Note. I.V. Novopokrovsky distinguishes two varieties of this species: *G. angustissima* (Tausch) Novopokr. var. *tenuifolia* (Lindl.) Novopokr. op. cit. (1948) 136—with narrow leaves, and *G. angustissima* (Tausch) Novopokr. var. *squamosa* (DC.) Novopokr. op. cit. 137—with broad leaves. In my opinion, these varieties hardly deserve special names, and I prefer to refer *G. squamosa* DC., on which the second variety is based, to the previous species. *G. crinitoides* Novopokr. op. cit. (1948) 137 and (1940) 227. (*Aster crinitoides* Novopokr. op. cit. (1948) 137, in syn.), described by I.V. Novopokrovsky as a separate species, is undoubtedly of hybrid origin: *G. angustissima* × *G. divaricata*. According to the form of the leaves and the nature of the pubescence, the specimens of this species from South Bashkiria and from the region of the city of Karkaralinsk in Kazakhastan occupy an intermediate position between the two species, and, apparently, they are sterile. Ligulate florets are absent or not fully developed. Hybrids of *G. angustissima* × *Linosyris villosa* also are known from the vicinity of the city of Saratov, which show a greater resemblance to the second parent.

Series 2. Divaricatae Tzvel.—Capitula with or without ligulate florets; plants covered with tomentose pubescence; leaves oblong to oblongly linear.

171 23. **G. divaricata** (Fisch. ex M.B.) Novopokr. in Izv. Ross. Ak. Nauk, Ser. 6, XII (1918) 2274, in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, VII (1948) 138 and in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XI (1949) 228. —? *G. leptophylla* (Desf.) Nees ab Esenb. Gen. et Sp.

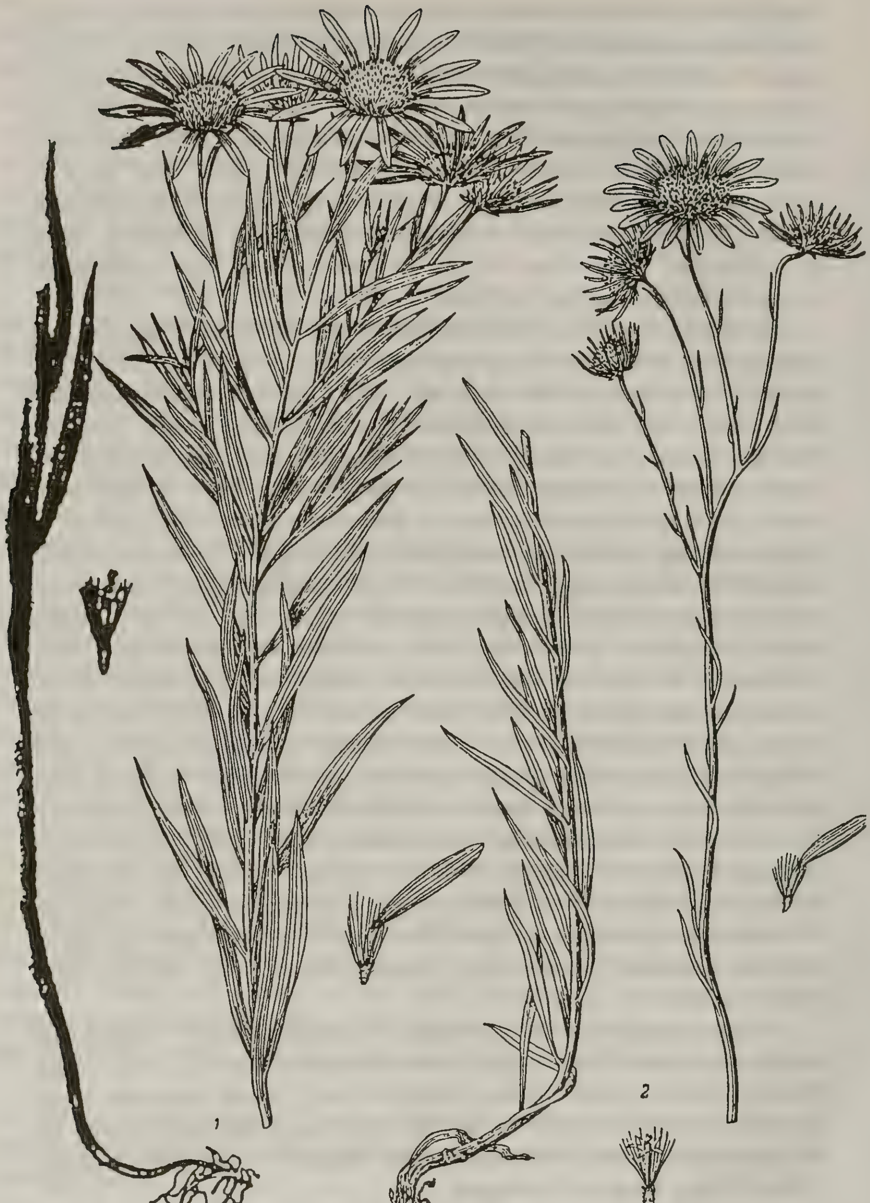
Aster. (1833) 167; DC. Prodr. X, 256. —*Chrysocoma divaricata* Fisch. Cat. Horti Gorenk. ed. 2 (1812) 37, nom. nud.; Fisch. ex M.B. Fl. taur.-cauc. III, 563.—*C. conyzoides* Fisch. ex Ldb. Fl. Ross. II, 496, in syn. —*Linosyris divaricata* (Fisch. ex M.B.) DC. op. cit. 352; Ldb. op. cit. 496; Krylov, Fl. Zap. Sib. XI, 2677.—*Aster virgatus* Schultz Bip. In F. Schultz, Arch. Fl. I (1855) 130, non Moench (1802), non Nees ab Esenb. 1818, non Ell., 1824.—*A. divaricatus* (Fisch. ex M.B.) Schmalh. Fl. II, 43, non L. (1753). —*A. kirghizorum* Korsch. Tentam. fl. Ross. or. (1898) 205. —**Ic.:** Gmel. Fl. sib. II (1749) tab. 82, fig. 3; Novopokr. op. cit. (1948) 143, Plate X, Fig. 1.

Perennial. Plant 10–35 cm high, finely arachnoid-hairy, later floccose and covered with very short, papillose hairs, sometimes almost glabrous. Stem solitary or few, erect but basally often ascending, branched from middle or above with arcuately or obliquely upright branches terminating into one, less often two or three capitula on long peduncles. Leaves oblong or oblongly linear, 1.5–6.0 cm long and 3–10 mm wide, sessile or almost sessile, gradually narrowed toward base, short- or long-acuminate, without punctate glands, grayish-green; lower and middle leaves three-veined; upper leaves one-veined; bracteal leaves (on inflorescence branches) highly reduced. Capitula usually few, in lax corymbs, usually with 15–20 florets, with disk 7–10 mm long. Involucre broadly obconical, 6–8 mm long and 8–12 mm wide; involucral bracts almost coriaceous, pale green, dorsally more or less covered with fine tomentum to almost glabrous; outer bracts smaller, ovately lanceolate, with cartilaginous cusp, along margin narrowly membranous, with one thick greenish vein; innermost bracts considerably larger, oblongly lanceolate, acuminate, along margin broadly membranous, with one, less often three veins. Disk florets pale yellow; ligulate florets one to seven, bluish- or pinkish-violet, sometimes fertile producing seeds, often entirely absent; appendages of style branches half to two-thirds as long as branches. Achenes 3–4 mm long; pappus 5–6 mm long, whitish. Flowering VII–IX.

Steppes, rocky and clayey slopes. —*European Part*: Volga-Kama (southeastern part); Trans-Volga, Lower Don (eastern part), Lower Volga; *Western Siberia*: Upper Tobol (southern part), Irtysh (southern part); *Soviet Central Asia*: Aralo-Caspian (northern part), Balkhash Region (in the region of the city of Karkaralinsk). Endemic. Described from the Lower Volga. Type in Leningrad.

Note. I.V. Novopokrovsky separates the following two forms of this species, with and without ligulate florets, probably representing indistinct ecogeographical races:

172 f. *radiata* (Trautv.) Novopokr. op. cit. (1918) 2274. —*Linosyris divaricata* var. *radiata* Trautv. in *Bull. Soc. Nat. Mosc.* XXXIX (1866) 341;



169 Plate XII.

1—*Galatella dahurica* DC., habit, tubular disk floret and ligulate floret; 2—*G. tianschanica* Novopokr., habit, tubular disk floret and ligulate floret.

f. *discoidea* (Schultz Bip.) Novopokr. op. cit.(1918) 2274.—*Aster virgatus* f. *discoidea* Schultz Bip. op. cit. 130—*Linosyris divaricata* var. *discoidea* (Schultz Bip.) Serg. in Krylov, op. cit. 2678. The type specimen of the species belongs here.

Hybrids of this species with *G. angustissima* are known.

Series 3. Scopariae Tzvel. —Capitula always without ligulate florets; plants arachnoid-tomentose; almost all leaves (except lowermost) narrowly linear, involute.

24. **G. scoparia** (Kar. and Kir.) Novopokr. in Izv. Ross. Ak. Nauk. Ser. 6, XII (1918) 2274 and in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, VII (1948) 138.—*Linosyris scoparia* Kar. and Kir. Enum. Pl. Song. (1842) 109; Ldb. Fl. Ross. II, 496; O. and B. Fedtsch. Consp. Fl. Turk. IV (1911) 168. —*Aster scoparius* (Kar. and Kir.) B. Fedtsch. Rastit. Turk. (1915) 731; non Nees ab Esenb. (1818), nec DC. (1836).—*A. iphionides* Schultz Bip. in F. Schultz, Arch. Fl. I (1855) 130.—**Ic.:** Novopokr. op. cit. (1948) 143, Plate X, Fig. 2.—**Exs.:** GRF No. 3257.

Perennial. Plant 20–45 cm high, covered with fine arachnoid, later floccose tomentum with mixture of spinules. Stems rather numerous, less often solitary, erect or basally ascending, branched above (sometimes almost from base) with arcuately or obliquely upright branches terminating into one, less often two or three capitula on long peduncles. Leaves sessile or almost sessile, gradually narrowed toward base, acute or subacute, without punctate glands, grayish-green; lowermost leaves linear, often three-veined (lateral veins not prominent), fugaceous; other leaves narrowly linear, up to 4 cm long and 0.8–2.0 mm wide, one-veined, involute; bracteal leaves (on axis of inflorescence) highly reduced, almost setaceous. Capitula in lax, often irregular corymbs, medium, usually with 14–20 florets, 12–17 mm long. Involucre broadly obconical, 10–15 mm long and 10–18 mm wide; involucral bracts almost coriaceous, bright green, often grayish due to fine arachnoid tomentum, short tomentose-fimbriate along margin, with one, less often some with three veins; outer bracts smaller, ovate or lanceolately ovate, acute or subacute; innermost bracts considerably larger, oblong, usually obtuse; all florets tubular, pale yellow; appendages of style branches slightly shorter then style branches. Achenes 4.5–6.0 mm long; pappus 6–7 mm long, whitish. Flowering VII–IX. (Plate XI, Fig. 2).

Arid steppes, rocky and clayey slopes, pebbled places. —*Soviet Central Asia*: Balkhash Region (southeastern part), Dzhungaria-Tarbagatai, Tien Shan (northern part). *General distribution*: Probably, Dzhungaria-Kashgaria. Described from southeastern Kazakhstan (Taldy Kurgan Province). Type and isotypes in Leningrad.

173 GENUS 1472. **Linosyris** Cass.[1,2]

Cass. in Dict. sc. nat. XXXVII (1825) 460, 476.—?*Crinita* Moench, Method. (1794) 378, non Houtt., 1777.—*Crinitaria* Cass. op. cit. 460, 475.—*Linosyris* (Cass.) Rchb. fil. Icon. Fl. Germ. XVI (1853) 8, pro subgen. gen. *Galatellae* Cass.—*Linosyris* (Cass.) Hoffm. in Pflanzenfam. IV, 5 (1894) 163, pro sect. gen. *Asteris* L

Capitula rather small, short-cylindrical or obconical, in corymbs, very rarely solitary. Involucral bracts many-rowed, imbricate, herbaceous or somewhat coriaceous, greenish, usually with much brighter, partly scarious margin, subglabrous or more or less arachnoid-tomentose, with one to five somewhat distinct veins, not identical to each other; outer bracts much shorter than oblong inner bracts or almost as long as inner ones but narrower, linearly subulate. Receptacle more or less convex, irregularly alveolate, all florets identical, tubular, bisexual, yellow, 5–40, in many rows, usually exceeding involucre, corolla five-fid with broadly lanceolate teeth or notches. Anthers at apex with broadly lanceolate appendages, obtuse at base; filaments of stamens glabrous. Style bifid, with ovately lanceolate obtuse appendages half to two-thirds as long as style branches. All achenes identical, oblong, narrowed toward base, more or less flat dorsally, without prominent longitudinal ribs or with one or two lateral ribs, 3–5 mm long, uniformly covered with rather long, semi-appressed hairs; hilum basal or sub-basal. Pappus somewhat longer than achene, 5–9 mm long, whitish, sometimes brownish, of two (three) irregular rows of identical scabrous spines, basally connate into ring. Perennial herbs with erect, more or less uniformly leafy stems, usually branched only at tip, arising from long, nodulose rhizome; leaves alternate, sessile, entire, oblong to narrowly linear, with or without punctate glands, all one-veined.

Type species: *L. vulgaris* Cass. ex Less.

Genus *Linosyris* includes five species distributed mainly in the steppe and forest-steppe zones of Europe and Asia, from the Atlantic coast of Europe in the west to the Altai and western provinces of China in the east. All species are found in the USSR.

Two sections of this genus, which can be considered also as much smaller, separate genera, are obviously genetically not closely related, as was correctly pointed out by I.V. Novopokrovsky (in *Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR*, XI, 1949, pp. 230–231). Section *Crinitaria* shows a distinct relationship with section *Fastigiatae* of the genus

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[1] Treatment by N.N. Tzvelev.

[2] From the names of two genera, *Linum* L. and *Osyris* L., owing to some similarity in the morphology of its vegetative parts with species of these genera.

174 *Galatella*, which is confirmed also by the existence of hybrids between species of these sections. Section *Linosyris* is more western in its range and occupies a rather distinct position, possibly being closer to section *Galatella* of genus *Galatella* than to section *Crinitaria*.

1. Outer involucral bracts ovate, obtuse or subacute, considerably shorter than innermost bracts; capitula with 5–10 florets (section *Crinitaria*)..2

+ Outer involucral bracts linearly subulate or narrowly linear, acuminate, almost as long as innermost bracts; capitula with 15–40 florets (section *Linosyris*)..3

2. Plants covered with very fine, glabrescent tomentum; leaves linear or oblongly linear, usually covered with punctate glands..........................5. **L. tatarica** (Less.) C.A.M.

+ Plants grayish-floccose; leaves oblong or oblongly linear, without punctate glands..........................4. **L. villosa** (L.) DC.

3. Plants strongly scabrous due to relatively long (well noticed without magnifying glass) papillate hairs mainly covering stem and dorsal surface of leaves.......3. **L. pontica** (Lipsky) Novopokr.

+ Plants glabrous or somewhat scabrous due to very short, papillate hairs and small spines mainly along leaf margin..4

4. Bracteal leaves and outer involucral bracts more or less arcuately bent from inflorescence axis, rather stiff; inflorescence usually strongly branched forming more or less compound corymb. Caucasus..........................2. **L. fominii** Kem.-Nat.

+ Bracteal leaves and outer involucral bracts less stiff, more or less bent toward branches of weakly branched, often simple corymb. Widely distributed species...1. **L. vulgaris** Cass. ex Less.

Section 1. LINOSYRIS. —Sect. *Eulinosyris* Novopokr. in Izv. Ross. Akad. Nauk, Ser. 6, XII (1918) 2280, pro sect. gen. *Galatellae* Cass. —Sect. *Eulinosyris* (Novopokr.) Kem.-Nat. in Vestn. Tifl. Bot. Sada, 3–4 (1927) 140. —Capitula with 15–40 florets. Involucre broadly obconical; involucral bracts almost equal, herbaceous, greenish; outer bracts narrowly linear or linearly subulate, gradually acuminate, one-veined; innermost bracts narrowed into lanceolately subulate or subulate tip from oblong base, one- to three-veined. Plants glabrous or scabrous due to very short papillate hairs and small spines.

Type of section: Type species.

175 *Note.* Of the three very closely related species of this section, the most widely distributed species is *L. vulgaris*, which is represented in the south of western Europe by not one but several more or less distinct ecogeographical races.

1. **L. vulgaris** Cass. ex Less. Synops. gen. Comp. (1832) 195; DC. Prodr. V, 352; Ldb. Fl. Ross. II, 495; Boiss. Fl. or. III, 161; Kem.-Nat. in Vestn. Tifl. Bot. Sada, 3–4 (1927) 140; Grossh. Fl. Kavk. IV, 96 and Opredel. Rast. Kavk. (1949) 441. —*Chrysocoma linosyris* L. Sp. pl. (1753) 841; M.B. Fl. taur.-cauc. II, 287. —*Aster linosyris* (L.) Bernh. Syst. Verz. Erf. (1800) 151; Schmalh. Fl. II, 43. —*Erigeron linosyris* (L.) Clairy. Man. d'herb. en Suisse et en Valais (1811) 243. —*Crinitaria linosyris* (L.) Less. op. cit. 195.—*Galatella linosyris* (L.) Rchb. fil. Icon. Fl. Germ. XVI (1853) 8; Novopokr. in Izv. Ross. Ak. Nauk, Ser. 6, XII (1918) 2275. —**Ic.:** Rchb. fil. op. cit. tab. 910; Fedtsch. and Fler. Fl. (1910) 951; Hegi, Ill. Fl. VI, 1, tab. 259, fig. 2; Bonnier, Fl. Compl. France, Suisse et Belg. V (1921) tab. 276; Javorka and Csap. Ic. Fl. Hung. (1933) 509. —**Exs.:** Fl. Gall. et Germ. exs., cent. 3, No. 81; A. Callier. Fl. siles. exs., No. 40; I. Dörfler, Herb. norm. No. 5109; F. Petrak. Fl. Bohem. et Morav. exs. No. 391; Fl. ital. exs. No. 1568; Fl. exs. austro-hung. No. 3805; Fl. exs. Reipubl. Bohem. Sloven. No. 71 and 921; Fl. Cechoslov. exs. No. 196; Fl. Polonica, exs. No. 161; GRF No. 571.

Perennial. Plant 10–50(70) cm high, glabrous or subglabrous (sometimes mixed with sparse arachnoid-tomentum in inflorescence), but usually weakly scabrous due to small spines mainly along leaf margins. Stems usually few or solitary, erect, branched above with obliquely upright branches terminating into one or many pedunculate capitula. Leaves linear or narrowly-linear, 1–7 cm long and 1–3 (less often up to 5) mm wide, often involute, sessile, gradually narrowed toward base, with very short cartilaginous cusp at apex, one-veined, with punctate glands above, less often entirely without glands, green; bracteal leaves (on inflorescence branches) usually rather numerous, strongly reduced, passing over to involucral bracts. Capitula in rather compact corymbs (very rarely solitary) with 15–40 florets, 8–12 mm long. Involucre broadly obconical (to almost hemispherical), 6–8 mm long and 7–15 mm wide; involucral bracts almost equal (less often outer bracts distinctly shorter than inner ones), herbaceous, with small papillate hairs along margin; outer bracts greenish, linearly subulate or narrowly linear, gradually acuminate, one-veined; innermost bracts from oblong base narrowed into lanceolately subulate or subulate tip, bright yellowish-green, with narrow scarious margin, one- to three-veined. All florets tubular, bright yellow. Achenes 3–5 mm long, usually with prominent lateral ribs;
176 pappus 5–6 mm long, whitish. Flowering VIII–X.

Steppes, scrubs, forest edges, rocky slopes, alkaline meadows. —*European Part*: Upper Dnieper (sporadic), Upper Dniester, Middle Dnieper, Volga-Don, Bessarabia, Black Sea Region, Lower Don, Crimea; *Caucasus*: All regions (in Transcaucasia, sporadic) except Talysh.

General distribution: Scandinavia (southern part), central Europe, Atlantic Europe, western Mediterranean (excluding Africa), Balkans-Asia Minor. Described from central Europe. Type in London.

Note. In the 'yaila' [mountain pasture] (Ai-Petri) in Crimea dwarf specimens of this species are found with one to a few capitula on the stem and distinctly shorter outer involucral bracts; all the same, apparently not forming a separate race. *L. vulgaris* var. *hemisphaerica* Kem.-Nat. op. cit. 141 having, according to the description of the author, wider, almost hemispherical capitula and dorsally short-pubescent involucral bracts, in our opinion hardly deserves any special taxonomic status (described from the region of the villages of Kodzhori and Manglisi).

2. **L. fominii** Kem.-Nat. in Vestn. Tifl. Bot. Sada, 3–4 (1927) 142; Grossh. Fl. Kavk. IV, 96 and Opredel. Rast. Kavk. (1949) 441. —**Ic.**: Kem.-Nat. in Fl. Gruz. VIII (1952) Plate 381.

Perennial. Plant 20–70 cm high, glabrous or subglabrous (usually mixed with sparse arachnoid tomentum in inflorescence), but weakly scabrous due to spinules and very short papillate hairs. Stems solitary or few, erect but basally often ascending, branched above, with obliquely upright branches terminating into many pedunculate capitula. Leaves linear or narrowly-linear, 2–5 cm long and 1–5 cm wide, often involute, gradually narrowed towards base, with very short cartilaginous cusp at apex, one-veined, more or less punctately glandular above, green; bracteal leaves (on inflorescence branches) rather numerous, strongly reduced, usually arcuately bent from inflorescence axis, passing over to involucral bracts. Capitula in strongly branched, often irregular corymbs, 7–10 mm long, with 15–30 florets; involucre broadly obconical (to almost hemispherical), 5–7 mm long and 6–9 mm wide; involucral bracts herbaceous, dorsally more or less arachnoid-hairy to almost glabrous, with very short papillate hairs along margin; outer bracts linearly subulate, greenish, one-veined, usually arcuate; innermost bracts lanceolately subulate from oblong base, bright green, scarious along margin, one- to three-veined. All florets tubular, bright yellow. Achenes 3–4 mm long; pappus 5–6 mm long, whitish. Flowering VIII–X.

Forest edges, scrubs, rocky slopes. —*Caucasus*: Ciscaucasia, western Transcaucasia (northern part), eastern Transcaucasia (northwestern part). Endemic. Described from vicinity of Tbilisi. Type in Tbilisi; isotype in Leningrad.

177 *Note*. Judging from the herbarium material at our disposal, this species is not clearly differentiated from *L. vulgaris*, and its separate status needs verification.

3. **L. pontica** (Lipsky) Novopokr. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XI (1949) 230. —*L. vulgaris* var. *pontica* Lipsky in Tr. Peterb. Bot. Sada, XIV (1897) 282 and in Fl. Kavk. (1899) 341. —*Galatella pontica* (Lipsky) Novopokr. and Bogdan in Uch. Zap. Rost. Univ. VI (1935) 44, in syn. —*G. linosyris* (L.) Rchb. fil. ssp. *pontica* (Lipsky) Novopokr. and Bogdan, op. cit. 44.

Perennial. Plant 15–40 cm high, strongly scabrous due to rather long (visible without magnifying glass) and stiff papillate hairs mainly on stem and dorsal surface of leaves, mixed with sparse arachnoid-tomentum above. Stems usually few, erect, from prostrate or ascending base, apically branched, with obliquely upright branches terminating into solitary or many pedunculate capitula. Leaves linear or narrowly linear, 1.5–5.0 cm long and 1–4 mm wide, often revolute, sessile, attenuate into short cartilaginous cusp at apex, one-veined, without punctate glands, green; bracteal leaves strongly reduced, passing over to involucral bracts. Capitula in rather compact corymbs, 7–9 mm long, with 15–30 florets. Involucre broadly obconical (to almost hemispherical), 6–7 mm long and 7–10 mm wide; involucral bracts herbaceous, dorsally finely arachnoid-pubescent, along margin ciliolate; outer bracts narrowly linear, gradually acuminate, greenish; innermost bracts usually longer, from oblong base narrowed into narrowly lanceolate tip, along margin narrowly membranous, one- to three-veined. All florets tubular, bright yellow. Achene 3–4 mm long; pappus 5–6 mm long, whitish. Flowering VIII–IX.

Rocky, mostly limestone slopes, scrubs. —*Caucasus*: Western Transcaucasia (northwestern part; between cities of Novorossiisk and Sukhumi). Endemic. Described from Abkhazia (Tuapkhash Range). Type in Leningrad.

Note. This species is obviously endemic to the western spurs of the Caucasian Range. I.V. Novopokrovsky reported it from the Kuban Mountains also, but we have not seen specimens from there.

Section 2. Crinitaria (Cass.) Kem.-Nat. in Vestn. Tifl. Bot. Sada, 3–4 (1927) 143. —Sect. *Crinitaria* (Cass.) Novopokr. in Izv. Ross. Ak. Nauk. Ser. 6, XII (1918) 2275, 2280, pro sect. gen. *Galatellae* Cass. — Sect. *Chrysocomella* Novopokr. in Fl. Yugo-vost. VI (1936) 316, diagnosis in Russian, pro sect. gen. *Galatellae* Cass. —Subgen. *Crinitaria* (Cass.) Novopokr. in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, VII (1948) 140 and in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XI (1949) 229, pro subgen. gen. *Galatellae* Cass. —Capitula with 5–10 florets. Involucre
178 short cylindrical to obconical; involucral bracts almost coriaceous, bright green but often grayish due to pubescence, not equal; outer bracts small, ovate, obtuse or acute, one- to three-veined; innermost bracts

considerably larger, oblong, obtuse, three- to five-veined; plants more or less canescent, sometimes almost glabrous.

Lectotype of section: *L. villosa* (L.) DC.

Note. Crinita punctata Moench [=*Linosyris punctata* (Moench) DC.] should have been regarded as the type of this section; however, as this species has not yet been studied adequately, I prefer to take *L. villosa* as the type, which is mentioned twice in the original description of the genus *Crinitaria* under the names *Conyza oleaefolia* Lam. and *Chrysocoma villosa* L.

4. **L. villosa** (L.) DC. Prodr. V (1836) 352; Ldb. Fl. Ross. II, 495; Boiss. Fl. or. III, 162; Grossh. Fl. Kavk. IV, 95; Krylov, Fl. Zap. Sib. XI, 2679. —*Chrysocoma villosa* L. Sp. pl. (1753) 841; M.B. Fl. taur.-cauc. II, 288. —*Conyza oleaefolia* Lam. Encycl. meth. II (1786) 86. —*Crinitaria villosa* (L.) Cass. Dict. sc. nat. XXXVII (1825) 476; Grossh. Opredel. Rast. Kavk. (1949) 441. —*Galatella villosa* (L.) Rchb. fil. Icon. Fl. Germ. XVI (1853) 8; Novopokr. in Izv. Ross. Ak. Nauk, Ser. 6, XII (1918) 2275. —*Aster villosus* (L.) Schultz Bip. in F. Schultz, Arch. Fl. I (1855) 130; Schmalh. Fl. II, 43, p. p. non Thunb. (1800); nec Michx. (1803). —*A. cinereus* Korsh. Tentam. fl. Ross. or. (1898) 205. —**Ic.:** Gmel. Fl. sib. II (1749) tab. 82; fig. 2; Rchb. fil. op. cit. tab. 910. —**Exs.:** Fl. exs. austrohung., No. 3806; GRF No. 1366 and No. 3258 a, b, c (under *Galatella villosa*).

Perennial. Plant 15–35 cm high, grayish-floccose; stems usually rather numerous, erect, branched above, with obliquely upright branches terminating into solitary or many, pedunculate capitula. Leaves oblong or oblongly-linear, 1.5–4.0 cm long and 3–10 mm wide, sessile or subsessile, gradually narrowed toward base, subacute or obtuse, without punctate glands; bracteal leaves (on inflorescence branches) strongly reduced. Capitula in rather compact corymbose inflorescence, 8–12 mm long, with 5–10 florets. Involucre short cylindrical or obconical (when flattened), 6–9 mm long and 4–6 mm wide; involucral bracts finely coriaceous, canescent due to finely tomentose pubescence, along margin short tomentose-fimbriate; outer bracts small, ovate, obtuse or acute, one- to three-veined; innermost bracts considerably larger, oblong, obtuse, three- to five-veined. All florets tubular, yellow. Achenes 3–4 mm long; pappus 6–9 mm long, whitish, sometimes with brownish tinge. Flowering VIII–IX.

Steppes, alkaline soils, stony slopes. —*European Part*: Volga-Kama; the Middle Dnieper, Volga-Don, Trans-Volga, Bessarabia, Black Sea Region, Lower Don, Lower Volga, Crimea; *Caucasus*: All regions (in Transcaucasia, sporadic); *Western Siberia*: Upper Tobol, Irtysh; *Soviet*
179 *Central Asia*: Aralo-Caspian (northern part), Balkhash Region (northern

and eastern parts). *General distribution*: Central Europe (southeastern part), Armenia and Kurdistan (northearn part), Dzhungaria-Kashgaria (western part). Described from Siberia (or southeast of the European Part of the USSR). Type in London.

Note. Obviously, in the Caucasus it segregates into a few barely noticeable ecogeographical races, and to differentiate them we must have more extensive and accurately labelled material. *L. villosa* var. *grandiflora* C. Koch in Linnaea XXIII (1850) 706, reported by C. Koch from Georgia, is distinguished by larger capitula, a less pubescent involucre and broader leaves. L.M. Kemulariya-Nathadze identifies three more varieties of this species from Georgia. These are *L. villosa* var. *nana* Kem.-Nat. in *Vestn. Tifl. Bot. Sada*, 3–4 (1927) 145, from the region of the town of Gori, up to 10 cm high with a few, two- or four-flowered capitula; *L. villosa* var. *ramosa* Kem.-Nat. ibid. 145, from the region of the town of Mashhad with a strongly branched inflorescence; *L. villosa* var. *angustifolia* Kem.-Nat. ibid. 145, from the Karayazskie steppes with wider capitula and glabrous and subacute innermost involucral bracts. I have not seen the specimens on which the descriptions of these varieties are based.

Hybrids of this species with *Galatella angustissima* (Tausch) Novopokr. are known.

5. **L. tatarica** (Less.) C.A.M. in Bong. and Meyer, Verzeichn. der. am Zaisang Nor und am Irtysch gesamm. Pfl. (1841) 38; Krylov. Fl. Zap. Sib. XI, 2678.— *L. glabrata* (Lindl.) DC. Prodr. V (1837) 353; Pavl. Fl. Tsentr. Kazakhst. III (1938) 224. —*L. punctata* (Moench) DC. op. cit. 352, p. p. — *L. tarbagatensis* C. Koch. in Linnaea XXIII (1850) 703. —? *Crinita punctata* Moench Method. (1794) 578.— *Aster dracunculoides discoideus minor* Ldb. Fl. alt. IV (1833) 18. —*A. villosus* (L.) Schultz Bip. var. *glabratus* (Lindl.) Schmalh. Fl. II (1897) 43. — *A. glabratus* (Lindl.) Korsh. Tentam. fl. Ross. or. (1898) 205. — *Chrysocoma tatarica* Less. in Linnaea IX (1835) 186. —*Crinitaria glabrata* Lindl. ex DC. op. cit. 353. —*C. tatarica* (Less.) Novopokr. in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, VII (1948) 141, in syn. — *Galatella punctata* (W. and K.) Nees ab Esenb. var. *discoidea minor* Ldb. Fl. Ross. II (1845–1846) 480, p. p. —*G. tatarica* (Less.) Novopokr. in Izv. Ross. Ak. Nauk, Ser. 6, XII (1918) 2275 and op. cit. (1948) 141.— **Ic.**: Novopokr. op. cit. (1948) 135, Plate VIII, Fig. 2.

Perennial. Plant 10–35 cm high, covered with very fine glabrescent arachnoid tomentum and very short papillate hairs, often subglabrous. Stems usually rather numerous, erect, branched above with obliquely spreading branches terminating into solitary or many pedunculate capitula. Leaves linear or oblongly linear, 1–4 cm long and 1.5–4.0 mm wide, sessile, gradually narrowed toward base, obtuse or subacute, one-veined, on both sides or only ventrally covered with punctate glands 180 (sometimes entirely absent), dull green; bracteal leaves (on inflorescence branches) rather numerous, strongly reduced. Capitula in rather compact corymbose inflorescence with 5–10 florets, 8–10 mm long. Involucre short cylindrical or obconical (when flat), 3.5–5.0 mm long and 4–6 mm wide; involucral bracts thin-coriaceous, bright yellowish-green, dorsally finely arachnoid-tomentose to almost glabrous, along margin short arachnoid-hairy-fimbriate; outer bracts small, ovate, obtuse or acute, one- to three-veined; innermost bracts considerably larger, oblong, with broadly membranous margin, obtuse, three- to five-veined. All florets tubular, pale yellow. Achenes 3–4 mm long; pappus whitish, sometimes with brownish tinge, 5–6 mm long. Flowering VII–IX.

Alkaline steppes, alkaline soils, stony slopes. —*European Part*: Volga-Don (along the Northern-Donets River), Lower Don (sporadic), Trans-Volga, Lower Volga; *Western Siberia*: Upper Tobol (southern part), Altai (southwestern part); *Soviet Central Asia*: Aralo-Caspian (northern part), Balkhash Region (northern and eastern parts), Dzhungaria-Tarbagtai. *General distribution*: Dzhungaria-Kashgaria. Described from the southern Urals (vicinity of the towns of Orsk and Sol-Iletsk). Type in Leningrad.

Note. The priority name of this species is probably *L. punctata* (Moench) DC. However, *Crinita punctata* Moench, on which it is based, is described too briefly and without any mention of its range; as a result, without type material of this species it is not possible to establish whether it is related to *L. tatarica* or is a synonym of *Galatella biflora* (L.) Nees ab Esenb., which is also quite possible.

L. tatarica is distinguished by considerable stability of its characters throughout its range. The known varieties of this species, viz., *L. tatarica* var. *scabra* Kar. and Kir. *Enum. Pl. Song.* (1842) 109, with scabrous leaves, *L. tatarica* var. *floribunda* Kar. and Kir. op. cit. 109, with stem branched almost from base, and *L. tatarica* var. *macilenta* Kar. and Kir. op. cit. 109, with very slender stems and narrowly linear leaves, in my opinion, hardly deserve special names.

GENUS 1473. **Pseudolinosyris** Novopokr.[1, 2]

Novopokr. in Izv. Gl. Bot. Sada, XVIII, 1 (1918) 12

Capitula narrow turbinate or cylindrical, with few (four to six)

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[1] Treatment by S.G. Tamamschjan.

[2] From the words: *pseudo*—false; and *linosyris*—name of a genus of the Compositae.

florets, homogamous, homochromous, aggregated into more or less lax compound corymb. Involucral bracts imbricate, many-rowed; outer bracts oval; inner bracts gradually elongating inward, along margin scarious and slightly fimbriate. Receptacle glabrous, alveolate, slightly elongated, alveolae sometimes with flat membranous edge. Florets four or five, less often three to six, bisexual, tubular-filamentous with five short 181 teeth or notches; corolla yellowish or pinkish below and strongly either yellowish-pink above, throughout or only above, with small glands throughout. Anthers yellow or pinkish, with lanceolate appendages above, obtuse below. Style in lower part gradually or abruptly bulbous, style branches long, their appendages linearly lanceolate, as long as branches of style, on outer or sometimes inner side hairy. Achene oblong, narrow, somewhat ribbed, slightly truncate, not densely pubescent, 3–6 mm long, covered with small lustrous glands. Pappus of somewhat setaceous, fine, white or pinkish hairs, usually longer than achene or corolla. A semishrub branching from base, leafless below (in old specimens), from middle and above covered with linear, linearly lanceolate, or oblong, entire leaves with prominent midrib.

All three species of this genus are known so far only from Soviet Central Asia.

Note. The genus *Pseudolinosyris* Novopokr. occupies a somewhat isolated position in the subtribe Asterinae; the long appendages of the styles, unusual for this subtribe, connect this genus to certain representatives of Solidagininae. Besides the special form and length of its styles, the genus *Pseudolinosyris* is distinguished from the other genera of this subtribe by the bulbous thickening of the style base and correspondingly enlarged base of the corolla tube, which is not characteristic for genera of the Asterinae, and also by the glabrous, slightly elongated receptacle.

1. Leaves and stem more or less densely covered with yellowish lustrous glands.......1. **P. grimmii** (Rgl. and Schmalh.) Novopokr.
+ Leaves and stem more or less canescent but without noticeable yellowish lustrous glands..2
2. Capitula small; excluding pappus 6–7 mm long, including pappus 12–15 mm long. Branches very slender, numerous, more than 50....................2. **P. microcephala** (Novopokr.) Tamamsch.
+ Capitula larger; excluding pappus 14–16 mm long, including pappus about 20 mm. Branches thicker, less numerous...3. **P. sintenisii** (Bornm.) Tamamsch.

1. **P. grimmii** (Rgl. and Schmalh.) Novopokr.in Izv. Gl. Bot. Sada, XVIII, 1 (1918) 12. —*P. grimmii* var. *glandulosa* Novopokr. ibid.—

P. grimmii var. *eglandulosa* Novopokr., ibid. —*P. capusii* Novopokr. ibid. p. p. —*Linosyris grimmii* Rgl. and Schmalh. in Tr. Peterb. Bot. Sada, V, 2 (1878) 614. —O. and B. Fedtsch. Perech. Fl. Turk. 4 (1911) 169.—*L. grimmii* var. *macrostyla* Rgl. and Schmalh. in Fedtsch. Putesh. v Turk. Vol. 18 (1882) 43. —*L. capusii* Franchet in Ann. Sc. Nat. ser. XVI, t. 6 (1883) 306. —*Aster grimmii* Fedtsch. Rast. Turk. (1916) 731, p. p.

Perennial. Stem branched, weakly sulcate, densely or sparsely cov-
182 ered with small lustrous yellowish glands and occasional multicellular hairs. Leaves dense, as long as internodes, usually longer, 2–4(5) cm long, 3–5 mm wide, lanceolate, with prominent and bright midrib beneath, lamina entire, weakly pubescent, with longer sparse flexuous hairs along margin and like stem covered with lustrous glands. Peduncles not equal, bearing one or two, less often three (then usually the third capitulum underdeveloped) capitula, almost erect, or somewhat divergent with two to four small bracteoles; capitula 2.0–2.2 cm long. Involucral bracts usually more than 20; outer bracts triangularly ovate, not acuminate; inner bracts oblong, obtuse or emarginate; all involucral bracts laciniate along margin and fimbriate-membranous, in middle and on sides straw-yellow, green above. Capitulum with four or five florets (six florets in specimens from Kugitang); corolla tube pinkish, particularly in upper part, with occasional small glands, and almost equal teeth or lobes. Achenes oblong, narrow, indistinctly angular, six-veined, of which two lateral veins much thicker, 5–6 mm long; pappus longer than achene and almost as long as or slightly shorter than corolla, of fine yellowish or white somewhat setaceous hairs. Flowering VII–IX. (Plate XI, Fig. 1).

Rubbly talus and stony slopes. —*Soviet Central Asia*: Syr-Darya, Pamiro-Alai, Tien Shan (west). Endemic. Described from valley of Chirchik River. Type in Leningrad.

2. **P. microcephala** (Novopokr.) Tamamsch. comb. nova. —*P. capusii* var. *microcephala* Novopokr. in Izv. Tr. Bot. Sada, XVIII, 1 (1918) 13.

Perennial. Stems slender, of almost same thickness throughout, 1.0–1.5 mm thick, virgate or arcuately ascending from base, numerous, weakly pubescent, usually without glands and with scarce visible small dull glands. Leaves 1.5–2.0 cm long, 1–2 mm wide, linear, lamina entire, rather thick, with occasional hairs and indistinct midrib. Peduncles short, 1.0–1.2 cm long, with three or four small (1 mm long) bracteoles above and a bract at base, almost straight, upcurved, like involucral bracts canescent outside; capitula small. Involucral bracts 12–18; involucral bracts triangular, acuminate; inner bracts oblonglyovate or oblong obtuse, abruptly cuspidate, along margin membranous and membranous-fimbriate. Corolla purple-pink in upper part. Achene oblong, slightly truncate, six-veined, not densely pubescent with upcurved hairs; pappus dark brown, somewhat longer than achene, as long as or slightly shorter than corolla. Flowering VII.

On granitic moraines and loamy soils. —*Soviet Central Asia*: Tien Shan (northeast). Endemic. Described from the banks of Susamyr and Dzhumgol. Type in Leningrad.

183 3. **P. sintenisii** (Bornm.) Tamamsch. comb. n. —*Staehelina sintensii* Bornm. in Mitteil. Thüring. Bot. Ver. 7, H. VIII (1903) 50. —*P. capusii* Novopokr. in Izv. Gl. Bot. Sada, XVIII, 1 (1918) 12, p. p.

Perennial. Stems strong, cylindrical with gray bark on old branches, 25–30 cm high; branches of second order reddish at base, yellowish-greenish above, almost glabrous, with small axillary buds below. Leaves in lower part fugaceous, not dense above, narrow, linear, 3–5 cm long, 2–3 cm wide, slightly revolute, one-veined, vein distinct only beneath, with short appressed hairs. Peduncles with few narrow small bracteal leaves; lower peduncles strongly arcuate, upper straight, stiff, up to 10–15 cm long, usually one-headed, less often with two. Capitula 2.5 cm long. Involucre cylindrical-conical, 2.2 cm long; involucral bracts more than 20–25; outermost bracts narrower, elongated triangularly ovate; innermost bracts oblong, two to three or three and one-half times as long as outer bracts, obtuse with scarious-fimbriate margin, darker above, weakly pubescent. Corolla pinkish, in upper half usually purple-reddish. Achene oblong, 7–8 mm long, with five or six veins or weak ribs on maturity; pappus pinkish particularly in lower part, longer than achene and as long as or slightly longer than corolla, of weakly setaceous hairs. Flowering VIII–IX.

Mountain slopes. —*Soviet Central Asia:* mountainous Turkmenia. Endemic. Described from Germab. Type in Leningrad.

GENUS 1474. **Tripolium** Nees [1, 2]

Nees, Gen. et Spec. Aster (1832) 152

Capitula heterogamous, obovoid, aggregated into paniculate inflorescence. Involucral bracts two-rowed, less often three-rowed, succulent; inner bracts considerably longer than outer, membranous along

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[1] Treatment by S.G. Tamamschjan.

[2] From two Greek words *tries*—three, and *poleion*—to change, because the inflorescence, i.e., the ligulate florets in the capitulum, changes color three times during the course of flowering.

margin, more or less lustrous, with thinner veins. Receptacle more or less flat, alveolae toothed along edges. Ligulate florets pistillate, fertile, usually one-whorled; disk florets tubular, bisexual, almost always yellow. Anthers without apical appendages, basally obtuse. Style in upper part thick and elongated. All achenes identical, compressed, oblong with thick lateral veins, glabrous or scatteredly hairy. Pappus strongly enlarged after flowering, simple, many-rowed, of white or pinkish lustrous, silky hairs, 184 two times as long as involucre and three to four times as long as achene. Annual plants with entire leaves.

Monotypic genus native to Europe, North Asia, and America.

1. **T. vulgare** Nees Gen. et Spec. Aster (1832) 152; Ldb. Fl. Ross. II, 477.—*T. longicaule* Duf. in Bull. Bot. Fr. VII (1861) 327.—*T. maritimum* Leveillé in Demid. Voy. Ross. Mer. II (1842) 192.—*T. pannonicum* Schur. Enum. Pl. Transs. (1853) 304.—*Aster tripolium* L. Sp. pl. (1753) 872; Ldb. Fl. alt. IV, 98; MB. Fl. taur. -cauc. II, 312. —*A. pannonicus* Jacq. Hort. Vindob. I (1770) tab. 8.—*A. maritimus* Lam. Enycl. méth. (1789) 303.—*A. palustris* Lam. Fl. Fr. II (1778) 143.—*A. carnosus* Gilib. Fl. lithuan. III (1781) 214.—*A. salinus* Schrad. Hort. Götting. (1809) 9.—**Ic.**: Rchb. Ic. Fl. Germ. XVI, tab. 907; Hegi, Ill. Fl. VI, 1, tab. 259, fig. 4, **Exs.**: Herb.: fl. cauc. No. 349.

Annual. Stem hollow, sulcate, erect, branched, often spreading from very base or only in upper part, glabrous, up to 80 cm high. Leaves more or less fleshy; lowermost leaves petiolate, oblongly ovate or lanceolate; lamina often as long as petiole, glabrous; middle and upper leaves sessile, linear or linearly lanceolate, variable in length and width, entire or somewhat toothed. Capitula numerous, in paniculate-corymbose inflorescence. Involucral bracts smooth, herbaceous, greenish, apically reddish, not similar; outer bracts short, ovate, one-fourth to one-third as long as inner, oblongly linear. Corolla of peripheral florets usually blue, sometimes pinkish, less often whitish, up to 15–18 mm long, 1.0–1.5(2) mm wide; tubular disk florets yellow. Achene usually glabrous, 1.5–2.0 mm long; pappus considerably longer than achene. Flowering V–X. (Plate IV, Fig. 3).

On solonchak and solonetz meadows, in coastal florets. —*European Part*: Karelia-Lapland, Baltic Region, Ladoga-Ilmen, Upper Dnieper, Middle Dnieper, Upper Volga, Volga-Don, Volga-Kama, Trans-Volga, Bessarabia, Black Sea Region, Crimea, Lower Don; *Caucasus*: All regions; *Western Siberia:* All regions; *Eastern Siberia*: Angara-Sayans; Dauria; *Far East:* All regions; *Soviet Central Asia*: Aralo-Caspian, Balkhash Region, Kyzyl-Kum, Kara-Kum, Pamiro-Alai, Tien Shan. *General distribution*: Central Europe, Balkans-Asia Minor, Northern Iran, Japan, China, North America and North Africa. Described from Central Europe. Type in London.

Note. It is an extremely polymorphic species in the shape of its leaves and size of the plants, depending on the degree of substrate moisture. Repeated attempts have been made to segregate several independent species without adequate basis. In fact the transition from the marine coastal zone to more arid continental conditions results in some changes in the morphology of the plant without affecting its main distinguishing features. Such modifications are not associated with a particular area of its distribution but are found at different geographical sites.

185 GENUS 1475. **Conyzanthus** Tamamsch. gen. n.[1,2]

Tamamschjan in Addenda XXIV, 583.—*Conyza* Spr. Syst. veg. III, 3 (1826) 515 p. p.—*Tripolium (oxytripolium)* DC. V (1836) 389 p. p.—*Tripolium (Astropolium)* Nutt. in Trans. Amer. Phil. Soc. n. s. VII (1841) 161 p. p. —*Aster (tripoliopsis)* Novopokr. in Dokl. Akad. Nauk Az. SSR, III, 12 (1947) 547 p. p

Small, not more than 1.5 cm long, homochromous and heterogamous capitula in more or less lax paniculate or racemose inflorescence. Involucre imbricate, narrow, three- or four-rowed. Bracteal leaves small, transitional to involucre; involucral bracts narrow, lanceolate, apically much thinner, acuminate, reddish, thicker in middle, straw-yellow, after flowering dry, stiff; innermost bracts oblong or linear, longer than or as long as peripheral florets. Receptacle flat, punctately alveolate, edges of alveolae narrowly membranous, in angles unevenly toothed; disk florets not numerous (four to six, seven), tubular, bisexual, very slender, with narrow tube and short teeth (lobes); narrow style branches covered with straight short hairs projecting above teeth. Anthers of tubular florets on more or less arcuately bent, glabrous filaments that are slightly thickened above, basally slightly truncate, acuminate, apical appendages of anthers short-conical. Peripheral florets 21–24, sometimes almost filiform, usually very narrow tubular with very short two- or three-toothed ligules as long as, shorter or slightly longer than style branches. Corolla pinkish, bluish, or pale-violet. All achenes similar, very narrow, four-angled with four distinct filiform ribs, basally with distinct hilum; pappus one-rowed, of identical, fine, less numerous, fragile, white or slightly pinkish, sometimes dark brown hairs. Hairs one and one-half times

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[1] Treatment by S.G. Tamamschjan.

[2] So named because of the similarity of the peripheral tubular-ligulate florests with those of the genus *Conyza*.

(sometimes less) as long as achenes and longer than corolla of disk and peripheral florets.

Of the three or four species of this genus growing in South America, we have two introduced ones.

1. Annual or biennial plants; stem glabrous below, simple, almost cylindrical; cauline leaves few, linearly lanceolate, 5–10 cm long, 0.5–1.2 cm wide.. ....1. **C. graminifolius** (Spreng.) Tamamsch.

+ Perennnial or biennial plants; stem strongly branched from base or middle, scabrous, somewhat angular; leaves 1.0–1.5(2) cm long, 0.2–0.5 cm wide, numerous; peduncles leafy up to capitula..........................2. **C. squamatus** (Spreng.) Tamamsch.

186 1. **C. graminifolius** (Spreng.) Tamamsch. comb. nova. —*Conyza graminifolia* Spreng. Syst. veg. III (1826) 515. —*Aster squamatus* Hieron. in Engl. Bot. Jahrb. XXIX (1901) 19 p. p.; Novopokrovsky in Dokl. Akad. Nauk Az. SSR III, 12 (1947) 547; Grossh. Opredel. (1949) 410 p. p. —*Aster squamatus* var. *graminifolius* Cabrera in Revista des Mus. de la Plata 5, IV Sect. Bot. (1941) 69; Fl. de los abred. de Buenos-Air. (1953) 478. —*Tripolium subulatum* var. *brasilianum* DC. Prodr. V (1836) 254 pp.

Annual or biennial. Root slender, vertical with very fine filiform secondary roots. Stem glabrous, slender, cylindrical, weakly striate, somewhat purple below, simple, weakly branched only in upper one-third to one-fourth, with fewer leaves. Leaves lanceolate, acuminate; lower leaves 8–10 cm long, basally narrowed into winged petiole, gradually reduced in upper part of stem; lamina glabrous, with occasional short cilia on both sides or only beneath, and prominent midrib, with weakly sheathing base (resembling leaves of graminous plants), undivided or with scarcely visible teeth. Peduncles in lower part of stem solitary, short, one or two in leaf axils with solitary capitulum; branching two or three times in upper part of stem, bearing one or two capitula; bracteal leaves subulate, 2–9 mm long, only at base of peduncles. Capitula 5–7 mm long. Involucral bracts imbricate; outer bracts 0.1–0.2 mm long; inner bracts 5–6 mm long; innermost bracts almost as long as or shorter than pappus. Corolla bluish, covered by pappus, pappus golden-creamish at base but white in upper part. Achenes barely 2 mm long, terete-angular, yellow, five-ribbed, toward tip and particularly downward strongly constricted, with upcurved stiff hairs, particularly along ribs. Flowering XI–X. (Plate IV, Fig. 2).

Vacant lands, weedy places, gardens, ditches, tea plantations.—*Caucasus*: Western and southern Transcaucasia. *General distribution*: South America. An introduced plant. Described from South America. Type in Berlin.

2. **C. squamatus** (Spreng.) Tamamsch. comb. nova.—*Conyza squamata* Spreng. Syst. veg. III (1826) 515; —*C. berteroana* Phil. in Linnaea XXVIII (1856) 737.—*Erigeron depilis* Phil. Ann. Univ. Chil. LXXXVII (1894) 403. —*Aster imbricatus* Walp. Repert. II (1843) 571. —*A. linifolius* Grieseb. Symbolae (1879) 178, non Torr. and Gray (1841). —*A. squamatus* Hieron. in Engl. Bot. Jahrb. XXIX (1901) 19 p. p.; Cabrera in Revista del Mus. de la Plata 5, IV (1941) 69, Fl. de abred. Buen.-Air. (1953) 478.

Perennial. Root thick, changing to vertical rhizome. Stem compared with previous species thick, cylindrical below, slightly colored, strongly branched from base or middle, slightly bent above, weakly ribbed and terete, scabrous like leaves due to small, white, scattered glands. Leaves in lower part of stem up to 2.0–2.5 cm long, 0.5–0.8 cm wide; in upper 187 part upcurved, half as long, narrow, dense, sometimes even imbricate, at base and above on peduncles almost subulate, sometimes smaller than inner involucral bracts; lamina of lower and middle leaves undivided, scabrous, with narrow, more or less cartilaginous, like lamina scabrous, white margin; midrib white, thin, scabrous, prominent only beneath. Peduncles very short, numerous, on lateral branches of stem covered with small bracteal leaves; capitula solitary, smaller than in previous species; maturity of capitula not synchromous, small undeveloped capitula in lower part of peduncles borne in axil of subulate bracteal leaf. Involucral bracts imbricate; outer bracts short; middle and innermost bracts with broader membranous margin than in previous species, with subulate apex. In other characters (nature of corolla and peripheral florets of disk, achene, and pappus), like previous species. Flowering IX.

Weedy places, ditches. —*Caucasus*: Eastern Transcaucasia (Baku). *General distribution*: South America and in western Europe as introduced weed. Described from Brazil. Type in Berlin.

Note. The plant described by I.V. Novopokrovsky (1937) from the Baku Botanical Garden under the name *Aster squamatus* Hieron. should undoubtedly be referred to *A. graminifolius* or, as now more correctly named, *C. graminifolius*. It is not understood why, citing the description of Sprengel, Novopokrovsky presumed error in the original description and instead of *"scaber"* as mentioned by Sprengel, wrote *"glaber"*. His presumption is probably based on the fact that the specimen collected by A.A. Grossheim from the Baku Botanical Garden had glabrous stems and leaves. However, Novopokrovsky did not pay attention to the fact that in Sprengel's description there are two adjacent species, one of them *C. squamatus* (*scaber*) and the other —*C. graminifolius* (*glaber*), which, as has already been mentioned, is distinguished not only by the nature of stem and leaf surface but also by the shape and position of leaves and a number of other characters. The description, given in the translated version, refers to *C. squamatus* Spreng. and not to the specimen collected in 1938 by A.A. Grossheim. The other specimens, also collected by Grossheim, but in 1946, corresponds to what was evidently described by Sprengel under the name *C. squamatus*. The latter is distinguished from *C. graminifolius* by the peduncles of the capitula being covered with small scaly leaves. So far as Hieronymus and Kabrer are concerned, they understood *A. squamatus* sensu lato and included herein species which are morphologically different and of different geographic origin.

At present both species have become acclimated to the Transcaucasus and grow as typical weeds.

In the literature (Daveau, 1924; Squivet and Penot, 1918) there is an indication that the beginning of the 20th century was the time when this weed was introduced from South America into the south of Europe
188 (France) and northern Africa, from which it spread widely in the Mediterranean Basin. Thus, it is possible that this species came to the Caucasus not from American culture stock and not directly from South America, but from southern Europe.

As regards the generic position of these species, given the careful study of them, there remains no doubt that they cannot be referred to the genus *Aster*, even if the latter is interpreted in the broad sense. Not without reason, Nuttall (1818) and Esenbeck (Nees von Esenbeck, 1833), citing the description of *A. subulatus*, synonymized with *A. squamatus* by some botanists, pointed out its close affinity to *Conyza* and put forward the possibility of segregating it as a separate genus.

The genus *Conyzanthus* is sharply distinguished from *Aster* mainly by the fact that its ray florets form a spiral in several whorls, which is not at all characteristic of the genus *Aster* (in which they are in one or one-and-a-half whorls) but is more characteristic of the genus *Erigeron*; by the shape of achene, which is terete-angular (in *Aster* the achenes are flattened) with ribs; and by the entirely different pappus, not truly ligulate florets, shape of the involucral bracts, and the shape of the style branches. In the nature of the capitulum, as well as in the short ligules, the genus *Conyzanthus* is closer to *Conyza*, but differs by the appendages of the anthers and by the style. These species cannot be referred to allied genera like *Tripolium, Erigeron,* and *Baccharis*, as done by different authors, as they differ from each of these genera by some essential characteristics.

GENUS 1476. **Brachyactis** Ldb.[1,2]

Ldb. Fl. Ross. II (1845) 495

Capitula many-flowered, heterogamous. All florets fertile and fruiting. Ray pistillate florets shorter than pappus, in many whorls, generally tubular, with tube much shorter than style, obliquely incised and ciliate above but without teeth or lobes; sometimes some or all pistillate florets develop short, glabrous, straight, but not toothed, ligule roundish at tip. Disk florets shorter than pappus, bisexual, tubular, with five glabrous teeth; style branches of pistillate florets filiform, those of bisexual florets lanceolate, acute. Anthers without basal appendages. Pappus two-rowed, of toothed, white, fragile, equal bristles, longer than achene. Achenes without beak, in transverse section terete, without distinct edges, with two to four longitudinal ribs and semi-appressed, rather long, somewhat stiff hairs. Receptacle flat, glabrous, slightly alveolate.

Annual, rather succulent plants, sparsely pubescent with cartilaginous 189 cilia. Stem erect, leafy, branching from base; branches usually short, forming racemose-paniculate inflorescence. Leaves narrowly linear or linearly lanceolate, entire, gradually acuminate; leaves of branches transitional to herbaceous involucral bracts; leaves and involucral bracts with cartilaginous cilia along margin and cartilaginous mucronate apex.

The genus is represented by five species.

Type species: *B. ciliata* Ldb.

1. **B. ciliata** Ldb. Fl. Ross. II (1845) 495; O. and B. Fedtsch. Perech. Rast. Turk. IV, 167; Novopokr. in Spisok Rast. Gerb. Fl. SSSR, XI, 26, p. p. excl. syn. *Erigeron latisquamatus* Maxim.; Botschantzev in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVI, 384. —*Erigeron ciliatus* Ldb. Ic. pl. (1829) 24; Fl. Alt. IV, 92; Boiss. Fl. Or. III, 169; Popov in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, No. 7, 11; Krylov, Fl. Zap. Sib. XI, 2691. —*Conyza altaica* DC. Prodr. V (1836) 380. —*Aster angustus* Torr. and Gray ex Gray Synopt. Fl. N. Amer. II, 2 (1884) 204, p. p. quoad pl. asiaticam. —*Erigeron cupularoides* Freyn in Öst. Bot. Zeitscher. XLV (1895) 343.—*Aster ciliatus* B. Fedtsch. Rast. Turk. (1915) 731. —*A. brachyactis* Blake in Contrib. U.S. Nort. Herb. XXV (1925) 564, p. p. quoad pl. asiaticam. —*A. latisquamatus* Hand.-Mazz. in Acta Horti Gotoburg. XII (1938) 24 p. p. quoad syn. *Brachyactis ciliata* Ldb. —**Ic.**: Ldb. Ic. pl. t. 100. —**Exs.**: GRF Nos. 1075, 3253.

Annual. Stem 2–60 cm high, often reddish below, in upper half and on branches covered with scattered cartilaginous cilia, densely leafy,

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[1] Treatment by V.P. Botschantzev.

[2] From the Greek words *brachys*—short, and *actis*—ray, because of the small ligulate florets sometimes developing in the capitulum.

erect, with short, simple, obliquely upright branches from base bearing one to five capitula; terminal capitula on branches and stem long-pedunculate, lateral capitula short-pedunculate; sometimes stem simple, one-headed (in smaller specimens) or with strong ascending secondary branches. Inflorescence racemose-paniculate. Lowermost leaves petiolate, others sessile, linear or linearly lanceolate, semi-amplexicaul, somewhat decurrent, from base toward branches reduced gradually, transitional to involucral bracts, like bracts covered with fine, scattered hairs on ventral surface, along margin cartilaginous ciliate, but apex cartilaginously mucronate. Outer involucral bracts herbaceous, sometimes recurved; inner bracts in lower portion membranous along margin, herbaceous above. Capitula 1–2 cm wide, about 1 cm long. Tubular pistillate florets not colored, together with style about 4 mm long, scatteredly pubescent in upper half of tube and along margin; style exserted from tube over more or less one-third of its length. In pistillate florets devoloping ligule (up to 1.5 mm long) only slightly broader than tube, sometimes longer than style and pink colored. Bisexual disk florets about 4 mm long, scattered-pubescent in middle, colorless or sometimes
190 with pink teeth. Pappus more or less 6 mm long, about one-third exserted from involucre; achenes about 2.25 mm long and 0.75 mm wide. Flowering VIII–X. (Plate XVII, Fig. 3) .

In solonchak meadows, along wet banks of streams, swamps and lakes in lowlands. —*Western Siberia*: Ob Region, Upper Tobol. Irtysh, Altai; *Eastern Siberia*: Angara-Sayans, Dauria; *Far East*: Ussuri (Lake Khanka, villages of Baranovskoe and Shmidtovka); *Soviet Central Asia*: Aralo-Caspian, Balkhash Region, Syr-Darya (Syr-Darya, and Chirchik rivers, Fedchenko station), Pamiro-Alai (cities of Samarkand and Pendzhikent), Tien Shan (tributaries of the Chu River, Lake Issyk-Kul). *General distribution*: Dzhungaria-Kashgaria, Mongolia, Japan, China. Described from specimens grown in Dorpat (Tartu) from seeds collected between the city of Barnaul and the village of Loktevskii. Type in Leningrad.

Note. The drawing of *Brachyactis ciliata* Ldb. in the publication of Ledebour (l. c.) does not correctly represent the plant. In the plate, a plant is drawn that was grown under unusual conditions, as a result of which it shows strongly developed vegetative organs and few capitula. Such specimens are almost never found under natural conditions. Besides, in the plate it is not depicted clearly enough that the ligule of the pistillate floret comes off a *not* at rather long tube and does not arise directly from the ovary, as may be presumed after a cursory look at the diagram. Furthermore, neither in the plate nor in the accompanying description is it mentioned that the tubular pistillate florets are found on the plant along with the ligulate florets, as this is a characteristic of the type specimen and sometimes is found also in other specimens as well.

The unsatisfactory diagram, not sufficiently clear description, wide distribution of the species, and also the comparatively insignificant differences from the closely related species led to the situation that, firstly, *B. ciliata* Ldb. was described anew several times and, secondly, renamed repeatedly a number of times, and united with other species.

Kitamura, in the catalog of the Compositae collected by Tatewaki (*Transact. Sapporo Nat. Hist. Soc.* XVI, 2, 1940, 64), cites without any basis *B. latisquamata* (Maxim.) Kitagawa and *B. linearifolia* Winkl. in the list of synonyms of *Brachyactis ciliata* Ldb.

Investigation of the type of *B. latisquamata* (Maxim.) Kitagawa made it possible to establish that the upper part of involucral bracts in it is broader than the lower part, whereas in *B. ciliata* Ldb. the lower part is broader or equal to the upper part. Perhaps it is true that *B. latisquamata* (Maxim.) Kitagawa is not a separate species, but only a subspecies of *B. ciliata* Ldb.

B. linearifolia Winkl. is not even related to the genus *Brachyactis* Ldb. It is a typical *Heteropappus* Less. The type of *Brachyactis linearifolia* Winkl. has disk florets with glabrous teeth and very short ligules, not longer than the involucre. Among the species of the genus *Heteropappus* Less. only one, *H. tataricus* (Lindl.) Tamamsch., has disk florets with glabrous teeth but its ligules, are long, considerably longer than the involucre. Both plants are biennial and very similar in all other characters. However, until I get additional material, I am refraining from synonymizing these names, because only a single specimen—the
191 type specimen—of *Brachyactis linearifolia* Winkl. (the plant with short ligules) exists. Nevertheless, I will put forward the most probable hypothesis: *B. linearifolia* Winkl. is a short-ligulate form of *Heteropappus tataricus* (Lindl.) Tamamsch.

GENUS 1477. **Erigeron** L. [1, 2]

L. Sp. pl. (1753) 863; Vierh. in Beih. Bot. Centralbl. XIX, 2 (1906) 471; Cronquist in Brittonia 6, 2 (1947) 121; Popov in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, No. 7 (1948) 7. —*Conyza* L. Sp. pl. (1753) 861, p. p. —*Eshenbachia* Moench Meth. pl. (1794) 573. —*Trimorpha* Cass. in Dict. sc. nat. III, Suppl. (1816) 65; Vierh. in Beih. Bot. Centralbl.

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[1] Treatment by V.P. Botschantzev.

[2] From the Greek words *eri*—early, in effect, and *geron*—old, because of the light-colored (gray) pappus after flowering, in contrast with the rich color of the flowering capitula.

XIX, 2 (1906) 422. —*Leptilon* Raf. in Amer. Monthly Magaz. (1818) 268. —*Trimorphaea* Cass. in Dict. sc. nat. XXXVII (1825) 462. —*Stenactis* Cass. in Dict. sc. nat. XXXVII (1825) 462 and 485. — *Phalacroloma* Cass. in Dict. sc. nat. XXXIX (1826) 404.—*Conyza* Less. Gen. Compos. (1832) 203, nom. conserv. (1956). —*Heterochaeta* DC. Prodr. V (1836) 282. —*Caenotus* Raf. Fl. Tellur. II (1836) 50. — *Conyzella* Rupr. Fl. ingr. (1860) 558; in Mém. Acad. Pétersb., sér. 7, XIV (1869) 51. —*Psychrogeton* Boiss. Fl. or. III (1875) 156.

Capitula with ray or disk florets. Involucral bracts herbaceous, many-rowed, without appendages, linearly lanceolate, acute, sometimes with membranous margin; outer bracts as long as inner ones, less often shorter, sometimes half as long. Florets homochromous, white, pink, violet, lilac, bluish, blue, yellow, orange or red, after flowering sometimes changing color (yellow florets become red), or heterochromous, then peripheral florets colored as above, but disk florets mostly yellow; florets in capitulum always represented by two or three forms; peripheral florets in two or more whorls, pistillate, ligulate or tubular; sometimes all of them together in same capitulum; ligulate florets without teeth or with two or three teeth at tip; disk florets bisexual, tubular, four- or five-toothed; anthers without basal appendages; style branches of pistillate florets filiform, those of bisexual florets lanceolate, acuminate. Pappus sessile, consisting of one or two rows of scabrous, fragile, colorless or sometimes rusty bristles, not shedding, free or sometimes slightly connate at base; all bristles identical, long or, more often, outer bristles very short, membranous, but inner bristles usually long, sometimes in pistillate florets bristles entirely replaced by a short crown of scales (species of section *Phalacroloma* Torr. and Gray). Achenes lanceolate or oblongly lanceolate, flat, usually densely pubescent with somewhat stiff, semi-appressed hairs, less often hairs very fine, scattered
192 and appressed; sometimes achenes with sessile capitate glands; usually all florets fruiting, less often only pistillate florets in capitulum; receptacle flat or slightly convex, with inconspicuous alveolae, glabrous.

Perennial herbs, less often annuals, biennials, or semishrubs, pubescent with long or short, soft or stiff, straight or flexuous and entangled, appressed or erect, multicellular unbranched hairs, sometimes mixed with short-stalked capitate glands, occasionally glabrous; leaves alternate, undivided, entire or toothed; stems leafy, less often leafless, simple, single-headed or variously branched with capitula in racemes, corymb or panicle.

The identification of specimens in the genus *Erigeron* L. is very often a difficult task because species of this genus hybridize with each other in the most diverse combinations. Similar hybrids from the Caucasus were published under the binomial names—*E. raddeanus* Vierh., *E. schelkovnikovii* Vierh. and *E. woronowii* Vierh. in *Bull. mus. Géorgie* VI, 1931, 120–123. Their descriptions have been omitted from the present treatment. The fleabanes hybridize particularly freely in the mountains of Soviet Central Asia. These materials need further studies.

Very few species are cultivated as ornamental plants, but there could be many more often. Some species grow as weeds.

The genus has more than 200 species, distributed in Europe, Asia, America, Africa, and Australia.

Type species: *E. uniflorus* L.

1. Teeth of tubular bisexual disk florets with simple hairs or capitate, almost sessile, glands....................2
+ Teeth of tubular bisexual disk florets glabrous....................20
2. Teeth of tubular bisexual disk florets with capitate, almost sessile, glands....................14. **E. oharai** (Nakai) Botsch.
+ Teeth of tubular bisexual disk florets with simple hairs....................3
3. Florets in capitulum heterochromous (peripheral pistillate florets blue; tubular bisexual disk florets yellow); ligules very long, 10–33 mm....................4
+ Florets in capitulum homochromous: yellow, straw-yellow, pink, purple or entirely colorless; ligules either short (not longer than 4.5 mm) or peripheral pistillate florets tubular, without ligules....................5
4. Ligulate florets 24–35 mm long, shedding after flowering; style branches of disk florets more than 2 mm long; capitate glandular hairs of stem, long stalked....15. **E. flaccidus** (Bge.) Botsch.
+ Ligulate florets 12–21 mm long, not shedding after flowering; 193 style branches of disk florets shorter than 2 mm; capitate glandular hairs of stem short-stalked....................16. **E. heterochaeta** (Benth.) Botsch.
5. All florets in capitulum fruiting....................6
+ Peripheral pistillate florets, fruiting, but bisexual disk florets not developing achenes....................9
6. Peripheral pistillate florets tubular, without teeth, but sparsely ciliate in upper part............71. **E. umbrosus** (K. and K.) Boiss.
+ Peripheral pistillate florets with small ligule, glabrous along upper margin....................7
7. Annuals; capitula in lax panicles..............72. **E. crispus** Pourr.
+ Perennials; capitula solitary or in corymbose inflorescence....................8
8. Capitula solitary; achenes pubescent with very short appressed hairs....................59. **E. brachyspermus** Botsch.

+ Capitula usually in corymbose inflorescence; achenes pubescent with longer semi-appressed hairs..57. **E. pseuderigeron** (Bge.) M. Pop.

9. Pappus almost two times as long as achenes. Biennials, occasionally becoming perennials..10

+ Pappus more or less as long as achenes. Perennials................11

10. Peripheral pistillate florets tubular, without teeth, but with less numerous cilia above....70. **E. nigromontanus** Boiss. and Buhse.

+ Peripheral pistillate florets tubular or more or less with weakly developed three-toothed, glabrous ligule..69. **E. khorossanicus** Boiss.

11. Stems many-headed, divaricately branched in inflorescence ....68. **E. biramosus** Botsch.

+ Stems single-headed, less often branched once, very rarely individual branches branching twice..12

12. Hairs comparatively short, erect, straight, somewhat stiff, not forming tomentum. Capitate glandular hairs stalked, sometimes numerous..13

+ Hairs long, crisped, with entire plant or some parts more or less densely tomentose, sometimes pubescence predominantly of capitate, short-stalked, glandular hairs while long, crisped hairs sparse, not forming tomentum, or plant only with capitate, short-stalked, glandular hairs...15

13. Leaves obovate, obtuse. Ligules oblong, pink...58. **E. primuloides** M. Pop.

+ Leaves lanceolate or linearly lanceolate, acute. Ligules obovate, golden-yellow or yellow, often turning purple after anthesis...14 194

14. Style branches of pistillate florets as long as perianth. Ligules spirally recurved after flowering.......67. **E. dolichostylus** Botsch.

+ Style branches of pistillate florets shorter than perianth. Ligules unchanged after flowering or rolled into tube..66. **E. cabulicus** (Boiss.) Botsch.

15. Achenes finely pubescent. Hairs appressed but not connivent, articulate over entire plant............60. **E. olgae** Rgl. and Schmalh.

+ Achenes pubescent with much coarser semi-appressed, rather long, connivent hairs. Hairs simple (if present), not articulate..16

16. Ligules recurved, yellow or golden-yellow, after flowering often turning purple...17

+ Ligules straight or scarcely recurved, pale yellow only before flowering, during and after flowering purple or persistently purple...18

17. Leaves lanceolate. Ligules golden-yellow..65. **E. poncinsii** (Franch.) Botsch.

+ Leaves oblanceolate. Ligules yellow..64. **E. andryaloides** (DC.) Benth.

18. Ligules straight, cuneately narrowed toward apex, acute and undivided or with two or three comparatively large, acute, usually unequal teeth............................61. **E. alexeenkoi** Krasch.

+ Ligules straight or slightly recurved, obtusely rounded, entire or often with three small, obtuse teeth....................................19

19. Plant covered with only capitate, stalked glands..62. **E. karatavicus** N. Pavl.

+ Plants tomentose with long, soft, simple hairs, sometimes mixed with capitate, stalked glands.....63. **E. leucophyllus** (Bge.) Boiss.

20 (1). Peripheral pistillate florets in capitulum all similar, ligulate..21

+ Peripheral pistillate florets in capitulum of two types: some ligulate, others tubular or weakly short-ligulate..........................55

21. Achenes of pistillate florets with very short corona connate in a ring and fimbriate in upper part, membranous; achenes of bisexual florets with one-rowed pappus of short scales and comparatively long (longer than achenes) scabrous bristles.....22

195 + All achenes with identical pappus..23

22. Hairs in lower part of stem (particularly at base) scattered, erect, long; in upper part, particularly on branches, usually denser, appressed and shorter..............37. **E. annuus** (L.) Pers.

+ Hairs on entire stem and branches dense, appressed, small, more or less equal....................................38. **E. strigosus** Muhl.

23. Plant annual. Capitula numerous, small, in paniculate inflorescence..24

+ Plant perennial or very rarely biennial. Capitula comparatively large, solitary or few, in corymbose inflorescence..................25

24 Bisexual disk florets with four-toothed (very rarely three-toothed) corolla. Plant in lower part with only long hairs..35. **E. canadensis** L.

+ Bisexual disk florets with five-toothed corolla. Plants in lower part with long and short hairs.................36. **E. bonariensis** L.

25. Ligules of pistillate florets usually flat when dried. Anthers and style branches exserted from open disk florets.........................26

+ Ligules of pistillate florets, when dried, convolute. Anthers and style branches not exserted from open disk florets.................38

26. Middle cauline leaves toothed; basal leaves entire..1. **E. peregrinus** (Pursh) Greene

+ All leaves entire..27

27. Ligules yellow or orange........................8. **E. aurantiacus** Rgl.

+ Ligules blue, violet, lilac, pink or white....................................28

28. Plant, particularly involucral bracts and upper part of stem, predominantly or exclusively glandular-hairy with capitate, short-stalked glands...29

+ Plant not predominantly glandular-hairy...................................30

29. Involucral bracts dark colored, reddish...2. **E. leioreodes** M. Pop.

+ Involucral bracts light colored, greenish...4. **E. altaicus** M. Pop.

30. Ligulate florets two-whorled (plants of the Caucasus, Northern Urals, Eastern Siberia and Far East)..31

+ Ligulate florets three-whorled (plants of Soviet Central Asia) 35

196 31. Hairs in upper part of stem and on involucral bracts long, thick, somewhat stiff, straight or flexuous, erect or appressed.............32

+ Hairs in upper part of stem and on involucral bracts long, fine, soft, intertwined...34

32. Ligules blue (Kamchatka, Kuril Islands, Sakhalin Island)......... ....13. **E. thunbergii** A. Gray

+ Ligules pink or lilac (Caucasus, Northern Urals, Eastern Siberia)..33

33. Basal leaves narrowly linearly lanceolate, upper cauline leaves linear. Ligulate florets 22–24 (Northern Urals, Eastern Siberia) ....10. **E. silenifolius** (Turcz.) Botsch.

+ Basal leaves oblanceolate, upper cauline leaves lanceolate. Ligulate florets numerous (Caucasus)..............9. **E. venustus** Botsch.

34. Capitula smaller (up to 3 cm wide), on taller (about 20 cm high) stem. Ligules white. Basal leaves on floriferous stems, small and less numerous........11. **E. koraginensis** (Kom.) Botsch.

+ Capitula larger (up to 4 cm wide), on shorter (about 12 cm high) stem. Ligules white, lilac or violet. Basal leaves on floriferous stems large and numerous.......12. **E. komarovii** Botsch.

35. Ligules pink or lilac...36

+ Ligules blue...37

36. Stem simple, one-headed; involucral bracts not glandular hairy ....7. **E. allochrous** Botsch.

+ Stem usually branched, with many capitula. Involucral bracts pubescent with capitate, short-stalked, glandular hairs, and simple hairs...3. **E. seravschanicus** M. Pop.

37. Hairs on involucral bracts soft, intertwined, up to 4.5 cm long (Pamiro-Alai)..5. **E. vicarius** Botsch.

+ Hairs on involucral bracts somewhat stiff, erect, up to 2.25 mm long (Tien Shan, northeastern Pamiro-Alai — Alai and Trans-Alai ranges)..6. **E. azureus** Rgl.

38 (25). Involucral bracts glabrous (Soviet Central Asia)..31. **E. popovii** Botsch.

+ Involucral bracts pubescent..39

39. Outer involucral bracts almost half as long as inner bracts......40

+ Outer involucral bracts as long as or slightly shorter than inner bracts..43

197 40. Inner involucral bracts longer than disk...................................41

+ Inner involucral bracts shorter than disk...................................42

41. Achenes about 3 mm wide, with short appressed hairs not connivent.......................................30. **E. lonchophyllus** Hook.

+ Achenes about 0.6 mm wide, with longer, erect hairs overlapping each other..........................32. **E. oreades** Fisch. and Mey.

42. Disk florets conical. Plants with developed caudex...33 **E. pseuderiocephalus** M. Pop.

+ Disk florets tubular, abruptly narrowed below into narrower cylindrical tube. Perennial herbs without caudex...34. **E. trimorphopsis** Botsch.

43. Disk florets narrow conical..44

+ Disk florets tubular or almost tubular, abruptly narrowed below into narrower cylindrical tube...50

44. Cauline leaves numerous (15–20). Stem and leaves densely covered with short-stalked capitate glands mixed with few long, simple hairs (Arctic Siberia, Chukotka)...18. **E. plurifolius** Botsch.

+ Cauline leaves 3–16. Capitate glands not predominant on stem and leaves...45

45. Ligules blue (Soviet Central Asia).....22. **E. sogdianus** M. Pop.

+ Ligules white, pink or lilac..46

46. Ligules white (Caucasus).........................22. **E. schalbusi** Vierh.

+ Ligules pink or lilac..47

47. Stem many-headed, less often one-headed. Cauline leaves oblong-ovate, acuminate or broad lanceolate, acute...23. **E. caucasicus** Stev.

+ Stem one-headed or many-headed. Cauline leaves lanceolate or linearly lanceolate...48

48. Leaves pubescent with short, appressed hairs particularly beneath, along veins (Caucasus)...........19. **E. polymorphus** Scop.

+ Leaves without short appressed hairs (Altai, Soviet Central Asia)..49.

49. Plant taller, 5–28 cm high. Basal leaves oblanceolate...17. **E. petiolaris** Vierh.

+ Plant short, 3–16 cm high. Basal leaves linearly lanceolate...21. **E. pallidus** M. Pop.

198 50. Involucral bracts pubescent with intertwined, usually soft, less often stiff hairs, sometimes mixed with stalked capitate glands 51

+ Involucral bracts pubescent with straight, somewhat stiff hairs mixed with stalked capitate glands............29. **E. humilis** Greh.

51. Involucral bracts pubescent with colorless hairs (the Carpathians?, Caucasus)......................................24. **E. uniflorus** L.

+ Involucral bracts pubescent, at least partly, with colored hairs (Arctic, Siberia, Soviet Central Asia)......................................52

52. Hairs of involucral bracts yellowish (Soviet Central Asia)......53

+ Hairs of involucral bracts, at least partially, lilac (Arctic, Siberia)..54

53. Ligules lilac-pink (Tarbagatai, Dzhungarian Alatau, Tien Shan, Eastern Pamiro-Alai).................26. **E. lachnocephalus** Botsch.

+ Ligules bluish-violet (Pamiro-Alai).. ....27. **E. petroiketes** Rech. f.

54. Plant glandular-hairy with stalked capitate glands.................... ....28. **E. eriocephalus** J. Vahl.

+ Plant without stalked capitate glands...................................... ....25. **E. eriocalyx** (Ldb.) Vierh.

55 (20). Involucral bracts longer than disk.. ....56. **E. sachalinensis** (Fr. Schm.) Botsch.

+ Involucral bracts considerably shorter than disk, very rarely equal to it...56

56. Ligules not or slightly longer than disk. Achenes one-fourth to one-third as long as pappus. Biennials or perennials............57

+ Ligules much longer than disk, very rarely slightly longer than disk. Achenes one-third to half as long as pappus. Perennials 61

57. Cauline leaves upcurved, overlapping, covering stem completely...58

+ Cauline leaves deflexed, not overlapping and not covering stem completely...59

58. Entire plant grayish-green. Achenes half as long as pappus....... ....41. **E. podolicus** Bess.

+ Stem and involucral bracts reddish. Achenes one-fourth as long as pappus.......................................42. **E. baikalensis** Botsch.

59. Stem and sepals reddish-brown. Inflorescence corymbose ....43. **E. elongatus** Ldb.

+ Plant green. Inflorescence paniculate or racemose..................60

60. Involucral bracts covered with short-stalked capitate glands, 199 sometimes mixed with long, erect many-celled hairs. Lower cauline leaves usually toothed..........40. **E. kamtschaticus** DC.

+ Involucral bracts with long erect many-celled hairs. Cauline leaves without teeth..36. **E. acer** L.

61. Leaves linear, coriaceous. Stems flexuous..55. **E. schmalhausenii** M. Pop.

+ Leaves broader, linearly lanceolate or oblanceolate, not coriaceous. Stems not flexuous..62

62. Stems one-headed, less often many-headed, but then involucral bracts pubescent with soft, intertwined hairs.........................63

+ Stem many-headed, very rarely single-headed. Involucral bracts covered with stiff, straight hairs or stalked capitate glands or even both..64

63. Involucral bracts pubescent with straight, erect, colorless hairs..44. **E. alpinus** L.

+ Involucral bracts pubescent with soft, intertwined hairs, at least partially with colored septa...........45. **E. borealis** (Vierh.) Simm.

64. Ligules blue..65

+ Ligules of different color..66

65. Basal leaves entire...........................49. **E. tianschanicus** Botsch.

+ Basal leaves with numerous teeth..53. **E. badachschanicus** Botsch.

66. Ligules violet......................................47. **E. violaceus** M. Pop.

+ Ligules pink or lilac...67

67. Stem and involucral bracts reddish-brown (Caucasus)...54. **E. pseudelongatus** Botsch.

+ Stem and involucral bracts green or grayish-green, sometimes partly reddish...68

68. Entire plant densely glandular-hairy with capitate, stalked glands and few, long, erect, multicellular hairs.....46. **E. krylovii** Serg.

+ Entire plant pubescent with erect, multicellular hairs, sometimes mixed with capitate stalked glands, less often capitate glands predominant on sepals..69

69. Plant densely covered with erect, stiff, rather long multicellular hairs. Ligulate florets with long hairs (Kopetdag, Caucasus, Crimea)..51. **E. orientalis** Boiss.

+ Plant less densely or sparsely pubescent with long, erect, soft, multicellular hairs (Altai, Dzhungaria Alatau, Tien Shan, Pamiro-Alai)..70

200 70. Ligules pale pink. Hairs on involucral bracts very long ....52. **E. hissaricus** Botsch.

+ Ligules dark pink or lilac. Hairs on involucral bracts shorter 71

71. Ligules slightly longer than disk. Capitula 1–3 on stems ....50. **E. bellidiformis** M. Pop.

+ Ligules much longer than disk. Capitula more numerous, in corymbose inflorescence....48. **E. pseudoseravschanicus** Botsch.

Subgenus 1. **EUERIGERON** (DC.) M. Pop. in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, 7 (1948) 9. —Florets of two types, usually heterochromous; peripheral pistillate florets—lilac, violet, blue, sky-blue, pink or white; disk florets yellow with glabrous, very rarely pubescent, teeth or lobes; very rarely florets homochromous: yellow, orange, violet or lilac; florets not changing color after flowering. Achenes much (one-third to half as long) shorter than pappus, very rarely almost equal, developing in all florets. Involucre as long as disk, sometimes longer, very rarely shorter. Perennial herbs, less often semishrubs, annual or biennial herbs.

Section 1. PLATYGLOSSAE Botsch. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVI (1954) 338. —Ligulate florets in two or three whorls, ligules flat, recurved. Anthers and style branches of bisexual disk florets exserted. Pappus in all florets alike. Perennial herbs or semishrubs, with long multicellular hairs mixed wih stalked capitate glands or short appressed hairs. Leaves lanceolate, very rarely toothed.

Series 1. Peregrini Botsch. Perennial herbs; stems simple, foliaceous. Cauline leaves semiamplexicaul; middle leaves sparsely, finely and acutely serrate, other leaves entire. Hairs in pubescence articulate, sometimes mixed with short-stalked capitate glands. Ligulate florets two whorled; ligules flat, pinkish-red. Teeth of yellow disk florets glabrous.

1. **E. peregrinus** (Pursh) Greene in Pittonia 3 (1897) 166. —*Aster peregrinus* Pursh, Fl. Am. Sept. 2 (1814) 556; Ldb. Fl. Ross. II, 473. —*A. tilesii* Wikstr. in Acta Holm. (1822) 13.—*A. unalaschkensis* Less. in Linnaea 6 (1831) 122.

Perennnial. Stem simple, erect, leafy, 20–40 cm high, more or less glabrous below, somewhat densely pubescent above with almost appressed short and long articulate hairs. Lower cauline leaves oblanceo-201 late, acuminate, with broad, somewhat winged petiole, entire, 4.5–8.5 cm long, 1.0–1.5 cm wide; middle cauline leaves lanceolate or ovate, acuminate, sessile, semiamplexicaul, scatteredly, finely and acutely serrate-toothed, 2.0–6.5 cm long and 1.0–1.8 cm wide; uppermost leaves like middle but smaller and entire, 1–3 cm long and 0.4–1.5 cm wide; all leaves pubescent on both sides with scattered, almost appressed, short and long articulate hairs, hairs denser along margin and veins. Capitula solitary, with ligules 3.0–4.5 cm wide; involucral bracts linearly lanceolate, long acuminate, 8–9 mm long and 1.0–1.3 mm wide, densely pubescent dorsally and along margins with long and short articulate hairs and sometimes with short-stalked capitate glands at tip. Ray florets pistillate, two-whorled, pinkish-red, 13–15 mm long and 2.0–2.3 mm wide, linearly lanceolate, with two or three teeth at tip, flat, not convolute into tube even after drying; tube 2 mm long, glabrous; style branches linearly lanceolate; disk florets bisexual, numerous, tubular, yellow, five-toothed with short, scattered, appressed hairs in middle, but lobes glabrous; anthers exserted from floret; style branches broadly linear with broadly cuneate acute tips. Pappus one-rowed, about 3 mm long; achenes developing in all florets, lanceolate, rather densely pubescent with semi-appressed stiff, short, hairs. Flowering VIII–IX.

Along mountain slopes. —*Far East*: Kamchatka (Commander Islands). *General distribution*: Beringia, North America. Described from North America. Type in London.

Series 2. Pulchelli M. Pop. in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, 7 (1948) 9. —Perennial herbs with short branched rhizome. Stems simple, one-headed, very rarely branched with few capitula. Leaves entire. Pubescence of more or less long, multicellular hairs mixed with short-stalked capitate glands or appressed small hairs. Ligulate florets two- or three-whorled; ligules flat, white, orange, lilac or blue. Lobes of yellow disk florets glabrous.

2. **E. leioreades** M. Pop. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, VIII (1940) 52; Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, No. 7, 9; Kryl. Fl. Zap. Sib. XI, 2683.

Perennial. Stems usually many, simple, single-headed, more often branched, many-headed, 11–37 cm high, leafy, reddish, with scattered, not very long, upcurved, multicellular hairs, and particularly above with more or less numerous, short appressed hairs and stalked capitate glands. Leaves entire; basal leaves petiolate, oblanceolate, obtuse or acuminate, pubescent along margin and petiole with rather long, simple, upcurved, 202 ciliate, many-celled hairs, but with shorter, scattered, appressed hairs beneath, 0.7–14.5 cm long and 3–12 mm wide; cauline leaves 0.3–14.5 cm long and 0.5–12.0 mm wide; lower cauline leaves like basal; upper leaves sessile, lanceolate, acute, ciliate with erect, rather long multicellular hairs but with sparse, shorter, appressed hairs on both sides; uppermost leaves with some stalked capitate glands besides others. Capitula one to six, 18–23 mm wide and 9–11 mm long; involucral bracts not longer than disk, linearly lanceolate, acute, 0.5–0.7 mm wide and 5.5–6.0 mm long (outer bracts slightly shorter), dark colored, with scattered, long, erect, simple multicellular hairs and rather dense, capitate, stalked glands. Ray florets pistillate, about 7 mm long (of which tube 2.5 mm), pubescent in upper part of tube with sparse, short, simple appressed hairs; ligules with two teeth at tip, not distinctly flat, lilac, about 0.4 mm wide; disk florets bisexual, tubular, five-toothed, yellow, about 3.5 mm long, pubescent in upper half of tube with scattered short simple appressed hairs, lobes glabrous; anthers and stigma exserted from tube. Pappus about 5 mm long, bristles of outer row short; achenes flat, oblanceolate, about 3 mm long, with dense, semi-appressed, simple, rather long somewhat stiff hairs. Flowering VII–VIII.

In mountains, at the upper boundary of the forest among moraines.—*Western Siberia*: Altai. *General distribution*: Dzhungaria-Kashgaria (Dzhungaria). Described from Altai. Type in Leningrad.

3. **E. seravschanicus** M. Pop. in Bot. Mat. Gerb. Bot. Inst. Akad Nauk SSSR, VIII (1940) 54, nomen; Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, No. 7 (1948) 10. —*E. oreades* auct., non Fisch. and Mey.; M. Pop. in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, No. 7 (1948) 9, p. p. quoad plantam.

Perennial. Stems usually many, leafy, green, almost always branched and many-headed, 4–90 cm high, pubescent like leaves along margin and on both sides and like involucral bracts with rather long, erect, simple, many-celled hairs, scattered on stem below and on lower leaves, dense above on stem, upper leaves, and involucral bracts; long hairs mixed with stalked capitate glands on stem above, more numerous on involucral bracts but in upper part of stem; pubescence also includes short, appressed, simple hairs. Leaves green, entire; basal leaves petiolate, oblanceolate, acute, 1.2–25.0 cm long and 2.5–20.0 mm wide; cauline leaves 0.8–17.0 cm long and 1–19 mm wide, lower like basal leaves; upper leaves sessile, lanceolate, acute. Capitula 1–14, 0.9–1.6 cm long and 1.8–3.3 cm wide; involucral bracts green, linearly lanceo-
203 late, acute, 5.5–9.0 mm long (outer bracts slightly shorter) and 0.5–1.0 mm wide. Ray florets pistillate, 6.5–13.0 mm long (of which tube about 2.5 mm long), with scattered, short, simple appressed hairs on tube above; ligules not very flat, with two teeth at tip, lilac, 0.3–0.8 mm wide; disk florets tubular, bisexual, five-toothed, yellow or with lilac teeth, about 4.5 mm long, pubescent in upper part of tube with scattered, appressed, short, simple hairs; anthers and stigma exserted from corolla tube. Pappus 4.3–5.0 mm long (bristles of outer row very short); achenes linearly oblanceolate, appressed, 2.2–2.5 mm long, with short, semi-appressed, numerous, stiff hairs. Flowering VI–IX.

Among moraines, in subalpine meadows, in spruce and juniper forests at 2,200–3,500 m. —*Soviet Central Asia*: Tien Shan, Pamiro-Alai. *General distribution*: Dzhungaria-Kashgaria (Kashgaria). Described from the Zeravshan glacier in Soviet Central Asia. Type in Tashkent.

Note. It has been mentioned in the description of *E. seravschanicus* M. Pop. (l. c.) that it is found in the Pamiro-Alai and western Tien Shan. But in fact, it is distributed more widely—from the eastern Tien Shan in China to the Pamiro-Alai, and includes some of the specimens which are unjustifiably referred by M.G. Popov to *E. oreades* F. and M. (cf. the note appended to the latter species).

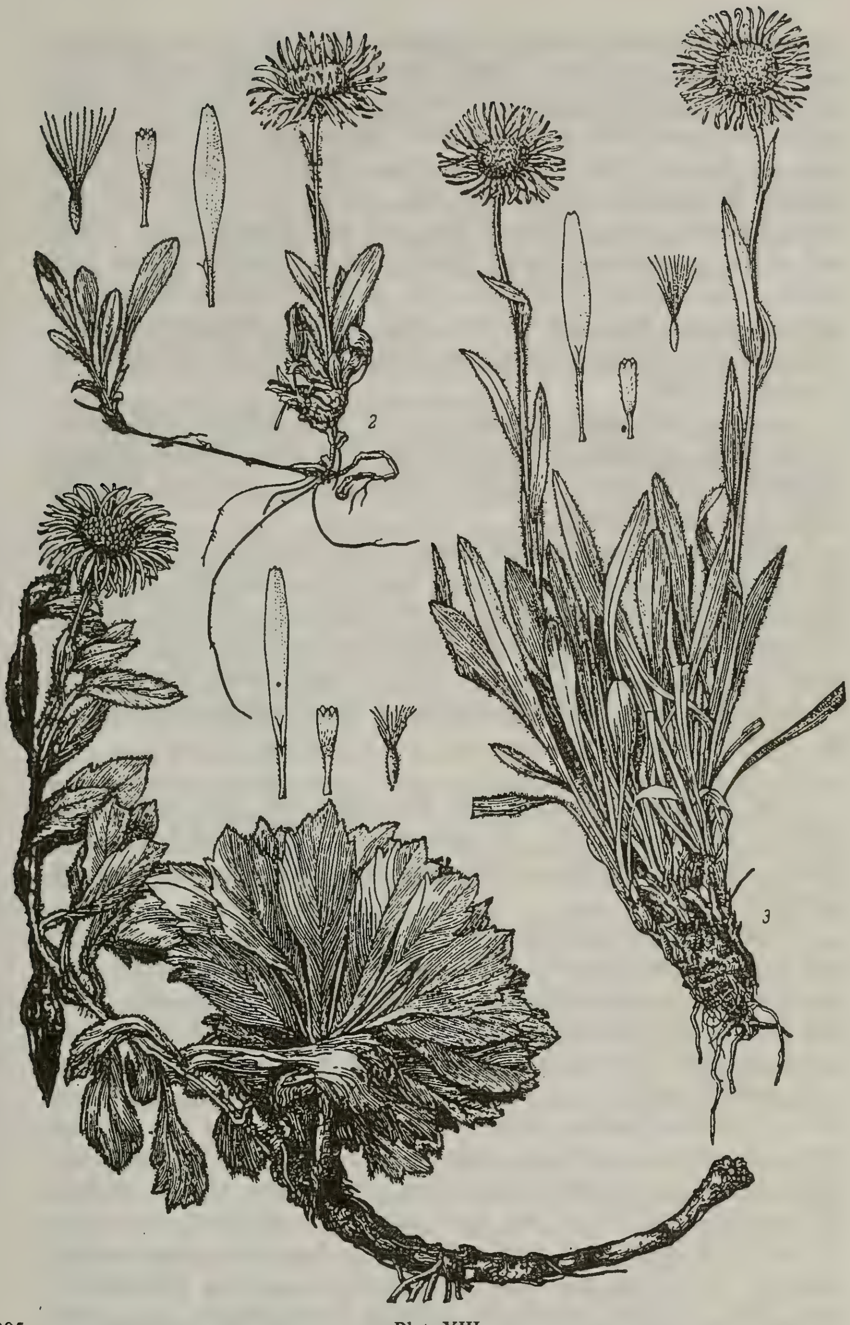
Thus, *E. seravschanicus* M. Pop. is one of the most widely distributed species of section *Platyglossa* in Central Asia. In different parts of the range and mainly in the Fergana Range and parts of the western Tien Shan and the adjacent Pamiro-Alai, as well as in the Trans-Ili Alatau and in the eastern parts of the Kungei- and Terskei-Alatau, it evidently hybridizes with other species of the section, but mainly with *E. azureus* Rgl. and *E. allochrous* Botsch. One can explain this by the fact that, in the above-mentioned regions, the clear boundary between *E. seravschanicus* M. Pop. on one hand, and *E. azureus* Rgl. and *E. allochrous* Botsch. on the other hand, disappears, and numerous unusual forms, intermediate between these species, appear. However, without a careful study under natural and experimental conditions, all this remains just an hypothesis.

In the Dzhungarian Alatau, Tarbagatai and Altai, *E. seravschanicus* M. Pop. is replaced by *E. leioreades* M. Pop. and *E. altaicus* M. Pop., which are very close to it.

The type for *E. seravschanicus* M. Pop. was not designated in the description of this species. Therefore, I am selecting as lectotype of the species, the plant preserved in the herbarium of the Soviet Central Asian University in Tashkent under No. 121839: Northern slope above the Zeravshan glacier. 21.VII.1918, fl. Balabaev—one of the few specimens of this species annotated by M.G. Popov himself.

4. **E. altaicus** M. Pop. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk 204 SSSR, VIII (1940) 53; Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, No. 7, 9; Kryl. Fl. Zap. Sib. XI, 2681. —*E. glabratus* auct., non Hoppe and Hornsch.: Ldb. Fl. Ross. II (1845–1846) 490.

Perennial. Stems usually many, branched, many-headed, sometimes simple, single-headed, 7–53 cm high, leafy, green or reddish, entire plant pubescent with simple, scattered, long, erect, multicellular hairs and also, particularly in upper part, on cauline leaves and involucral bracts with dense, stalked, capitate glands. Leaves green, entire; basal leaves 2–16 cm long and 4–10 mm wide, oblanceolate, obtuse with short mucronate apex, long-petiolate; cauline leaves 0.3–13.0 cm long, 0.5–10.0 mm wide; lower petiolate, oblanceolate; upper sessile, lanceolate, acute. Capitula one to eight, 1.2–2.0 cm long and 2.1–3.7 wide;



205 Plate XIII.

Habit; ligulate floret; bisexual disk floret; achene. 1—*Erigeron oharai* (Nakai) Botsch.; 2—*E. heterochaeta* (Benth.) Botsch.; 3—*E. venustus* Botsch.

involucral bracts green, linearly lanceolate, acute, 0.5–0.7 mm wide and 6–9 mm long, outer bracts slightly shorter. Ray florets pistillate, 8.5–13.0 mm long (of which tube 2.5 mm long), densely pubescent in upper part of tube with short, appressed hairs; ligules lilac, with two teeth at apex, not distinctly flat, 0.7–1.2 mm wide; disk florets bisexual, yellow, tubular, five-toothed, 3.6–4.3 mm long, pubescent in upper half with rather numerous, short, appressed hairs, but with glabrous lobes; anthers and stigma of bisexual florets exserted from perianth. Pappus two-rowed, inner bristles 3.5–4.0 mm long, outer very short; achenes linearly lanceolate, flat, about 2.7 mm long, densely pubescent with semi-appressed not very short hairs, developing in all florets of capitulum. Flowering VI–VIII.

In alpine and subalpine meadows. —*Western Siberia*: Altai; *Soviet Central Asia*: Dzhungaria-Tarbagatai (the Tarbagatai Range). *General distribution*: Dzhungaria-Kashgaria (Dzhungaria). Described from the Altai. Type in Leningrad.

Note. While citing plant specimens for the description of *E. altaicus* M. Pop., M.G. Popov did not select a type from among them. Of all the plants cited by him, it is best to select as lectotype the plant with the following label: Altai Mountains. Middle reaches of the Terekta River (Ak-Dzhailyaus). 1.VIII.1908, No. 280, V. Reznichenko (preserved in the herbarium of the Botanical Institute of the Academy of Sciences of the USSR in Leningrad).

5. **E. vicarius** Botsch. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVIII (1957) 260. —*E. azureus* Rgl. ex O. and B. Fedtsch. Perech. Rast. Turk. IV, (1911) 163 nom. nud., p. p. quoad pl. pamiralaicam.

Perennial. Rhizome short, branched. Stems many, 2.5–28.0 cm high, 207 and 1–3 mm thick, simple, erect, or ascending, single-headed, like leaves densely covered with long, soft, multicellular hairs, usually mixed with stalked, capitate glands. Leaves green, undivided and entire; basal leaves petiolate, linearly lanceolate, acute, 2–9 cm long and 2–11 mm wide; cauline leaves 3–12, linearly lanceolate or lanceolate, acute, sessile or lowermost leaves short-petiolate, 0.7–6.0 cm long and 1–6 mm wide. Capitulum 2.1–3.8 cm wide and 1.4–1.8 cm long; involucral bracts almost equal, linearly lanceolate, acute, green, apically reddish, 7–9 mm long and 1.0–1.8 mm wide, densely covered with long (up to 4.5 mm), soft, intertwined, many-celled hairs. Ray florets three-whorled, pistillate, 10–15 mm long (their tubes 2.3–3.0 mm long, pubescent in upper half with short, appressed, scattered hairs); ligules 1.0–1.5 mm wide, blue, straight, flat linear, acuminate; disk florets bisexual, tubular, yellow, five-toothed, 4.0–4.5 mm long, pubescent in upper half of tube with sparse, very short hairs. Pappus two-rowed, outer bristles short, inner 4.0–4.5 mm long; achenes 2.5–3.0 mm long and 0.5–0.6 mm wide, oblanceolate, flat, pubescent with appressed, somewhat stiff, scattered hairs. Flowering VII–IX.

Mountains at 2,850–4,100 m, among stones, on stony slopes or in alpine meadows. —*Soviet Central Asia:* Pamiro-Alai. *General distribution:* Dzhungaria-Kashgaria (Kashgaria), Indo-Himalayas (?). Described from Safidku Pass in the Darvaz Range. Type in Leningrad.

6. **E. azureus** Rgl. ex M. Pop. in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, No. 7 (1948) 9; O. and B. Fedtsch. Perech. Rast. Turk. IV (1911) 163, nom. nud., p. p. quo ad pl. tianschanicam.

Perennial. Rhizome short, branched. Stems usually many, 9–31 cm high and 2.5–3.5 mm thick at base, simple, erect, single-headed, more or less densely covered with erect, rather long, somewhat stiff, multicellular hairs mixed, particularly in upper part, with short, appressed hairs and short-stalked, capitate glands. Leaves green, entire, pubescent along margin and on both sides or only along margin and veins with rather long, somewhat stiff, erect, multicellular hairs; basal leaves petiolate, spatulate, obtuse, or oblanceolate or lanceolate, acute, 2.5–11.0 cm long and 3.5–13.0 mm wide; cauline leaves 5–11, lanceolate, acute, sessile or lowermost leaves short-petiolate, 0.7–7.0 cm long and 1.5–12.0 mm wide. Capitulum 2.5–4.5 cm wide and 1.2–2.2 cm long; involucral bracts almost equal. Linearly lanceolate, acute, green, apically violet, 6.5–8.5 mm long and 1.0–1.5 mm wide, somewhat densely covered with rather long (up to 2.25 mm), erect, straight, somewhat stiff, multicellular hairs. Ray florets three-whorled, pistillate, 10–18 mm long
208 (their tube 2.5–3.0 mm long, pubescent in upper half with short, appressed, scattered hairs); ligules 1.0–1.3 mm wide, straight, flat, blue, linear, apically with 2–3 small teeth; disk florets bisexual, tubular, yellow, five-toothed, 3.7–4.5 mm long, pubescent in upper half of tube with short, scattered, appressed hairs. Pappus two-rowed, outer bristles short, inner 3.5–4.0 mm long; achenes oblanceolate, flat, pubescent with appressed, somewhat stiff, straight, rather long hairs. Flowering VI–VIII.

Mountains, in alpine meadows and spruce forest at 2,500–4,000 m. —*Soviet Central Asia:* Tien Shan (from the At-Basha and Kirgiz Alatau ranges in the east to the Fergana Range in the west). Endemic. Described from the central Tien Shan. Type in Leningrad.

Note. In the herbarium of the Botanical Institute of the Academy of Sciences of the USSR I did not find even a single specimen annotated by E. Regel as *E. azureus* Rgl. But the few plants on which I saw E. Regel were annotated as such in the hand of Winkler. These are the plants of Fetisov from the central Tien Shan and E ["A"]. Regel from the Pamiro-Alai. E. Regel did not describe the species, but in the literature the name *E. azureus* Rgl. has been used (cf. for examle, O. and B. Fedtsch. l. c..). The distinguishing features of the species were first enumerated in a few Latin phrases, by Popov (l. c..). There Popov indicated that this plant is distributed in the central Tien Shan. Therefore, it can be said that *E. azureus* Rgl. ex M. Pop. was formally described and that the specimen originated from the central Tien Shan. It is appropriate to select the lectotype from plants collected by Fetisov, on the basis of which, .apparently, E. Regel described his species. The best preserved is the herbarium sheet with the label: Peak of the Susamyr Range, 9,000–10,000 f. 19.VII.1881, Fetisov. I am also selecting it as the lectotype of *E. azureus* Rgl. ex M. Pop. But the Pamiro-Alai plants referred by Winkler to this species belong to another new species —*E. vicarius* Botsch.

7. **E. allochrous** Botsch. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVIII (1957) 259.

Perennial. Rhizome short, branched. Stems often many, herbaceous, simple, single-headed, erect, leafy, 7–28 cm high and 1–3 mm thick at base, covered with long, erect, somewhat stiff, multicellular hairs, denser above, mixed with short appressed hairs. Leaves green, undivided and entire, pubescent along petiole, margin and veins beneath, sometimes on both sides with long, stiff, erect, multicellular hairs; basal leaves petiolate, obovate, obtuse or oblanceolate, acuminate, 1.2–12.0 cm long and 0.3–1.4 cm wide; cauline leaves 4–11, lanceolate or linearly lanceolate, acute, sessile or lowermost leaves short-petiolate, 0.8–7.0 cm long and 1–8 mm wide. Capitula 2.4 – 4.0 cm wide and 1.1–1.8 cm long; involucral bracts green, linearly lanceolate, acute, 6.5–8.0 mm long and 209 0.7–1.0 mm wide, densely pubsescent with somewhat stiff, erect, rather long, multicellular hairs. Ray florets pistillate, three-whorled, 9–15 mm long (their tube 2.5–3.0 mm long, pubescent in upper part with scattered hairs); ligules flat, lilac, 0.7–1.3 mm wide, linear, usually with two-teeth at tip; pappus two-rowed: outer bristles very short, inner 2.5–5.0 mm long. Disk florets yellow, tubular, five-toothed, 3.5 – 4.5 mm long, pubescent in middle with scattered appressed hairs. Achenes oblanceolate, flat, about 2.7 mm long and 0.7 mm wide, with appressed, somewhat stiff hairs. Flowering VII–IX.

Mountains, in subalpine meadows and spruce forests.—*Soviet Central Asia*: Dzhungaria-Tarbgatai (the Dzhungarian Alatau), Pamiro-Alai (the Alai and Trans-Alai ranges), Tien Shan. Endemic. Described from the central Tien Shan. Type in Leningrad.

8. **E. aurantiacus** Rgl. in Gartenfl. (1879) 289; Tr. Peterb. Bot. Sada, VI, 2 (1880) 305; O. and B. Fedtsch. Perech. Rast. Turk. IV, 163; Popov in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, No. 7, 9. —**Ic.**: Rgl. in Gartenfl. tab. 987, fig. 1 .—**Exs.**: GRF No. 2774.

Perennial. Rhizome short, branched. Stems usually many, straight, simple, single-headed or very rarely branched with two to four capitula, 5–48 cm high and 1.5–3.0 mm thick, often violet below, covered with more or less long, erect, somewhat stiff, multicellular hairs and also, particularly above, with short, fine, appressed hairs. Leaves green, entire, densely covered on both sides and along margin with long, erect, somewhat stiff, multicellular hairs; basal leaves acute, oblong-lanceolate or lanceolate, long-petiolate or obtuse, oblanceolate, short-petiolate, 0.7–22.0 cm long and 0.4–2.1 cm wide; cauline leaves 7–17, semiamplexicaul, acute, lower leaves lanceolate with rather long and broad petioles, upper lanceolate, sessile, 0.7–15.0 cm long and 0.1–2.4 cm wide. Capitulum 23–42 mm wide and 13.0–18.5 mm long; involucral bracts almost equal, somewhat longer than disk, lanceolate, acute, 7–9 mm long and about 1 mm wide, densely pubescent, with erect, stiff, rather long, multicellular hairs. Ray florets pistillate, three-whorled, 7.8–14.5 mm long (of which tube, pubescent with scattered appressed hairs, measuring 2.5 mm); ligules flat, yellow to brick-red, most often orange, 1.0–1.4 mm wide, with two or three teeth at tip; disk florets tubular, five-toothed, 4.0–5.5 mm long, in upper half of tube pubescent with scattered, appressed hairs. Pappus two-rowed, outer bristles short, inner long, 3.5–6.0 mm long; achenes linearly lanceolate, somewhat flat, about 2.5 mm long and 0.5 mm wide. Flowering VII–IX.

210 Mountains, in alpine meadows and spruce forests at 2,100–3,800 m. —*Soviet Central Asia*: Dzhungaria-Tarbagatai (Dzhungarian Alatau), Tien Shan (excluding the western part). *General distribution*: Dzhungaria-Kashgaria. Described from Tien Shan. Type in Leningrad.

Note. In the original description of *E. aurantiacus* Rgl. (Gartenfl. l. c.) it was mentioned that the species was described from plants grown in the garden; not a single herbarium specimen was mentioned in the description. In the herbarium of the Botanical Institute of the Academy of Sciences of the USSR also there are no specimens of *E. aurantiacus* Rgl. collected from the garden in the year of description or earlier that could be considered as the type. Hence, it is necessary to consider other materials for the selection of the type. A year later, i.e., in 1980, Regel repeated the description of his species in *Tr. Bot. Sada* (l. c.), and he cited there many herbarium specimens of various collectors. All these plants are preserved in the herbarium of the Botanical Institute of the Academy of Sciences of the USSR in Leningrad. Some of the plants cited by Regel belong to other species of the genus, which were described later, but the remaining plants, particularly the plants of Semenov from Turgen (Trans-Ili Alatau), are in fact *E. aurantiacus* Rgl. Semenov's plants (two specimens mounted on one sheet) are well preserved, and I am selecting them as lectotype of the species.

It is necessary to correct several errors made by Regel in the description of the species. For example, he writes that tubular female florets are characteristic of this plant. In fact the female florets are only ligulate, and the tubular ones only bisexual. Besides, his indication that the female florets are arranged in ten whorls is incorrect; in fact there are only three whorls. Similarly, it was incorrectly indicated in the description that the pappus is one-rowed; in fact it is two-rowed, but the bristles of the outer row of the pappus are short.

In the Trans-Ili Alatau (Tien Shan), particularly in the vicinity of Alma-Ata, it hybridizes with *E. lachnocephalus* Botsch.

9. **E. venustus** Botsch. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVI (1954) 387. —*Aster pulchellus* Willd. Sp. pl. III, 3 (1804) 2019; MB. Fl. taur.-cauc. II, 309. —*Erigeron pulchellus* DC. Prodr. V (1836) 287, non Michx. (1803); Ldb. Fl. Ross. II, 486; Boiss. Fl. Or. III, 164; Grossh. Fl. Kavk. Ed. 1, IV, 98. —**Ic.**: Fl. Gruzii VIII, Fig. 382 (as *E. pulchellus* DC.).

Perennial. Stem solitary or many, simple, single-headed, straight, herbaceous, 3.5–31.0 cm high and 1.0–2.5 mm thick at base, densely hairy throughout, like leaves on both sides and along margin and like involucral bracts on dorsal side and along margin with stiff straight, erect, rather long, multicellular, non-pigmented hairs, denser in upper part of stem and on involucre; usually long hairs mixed with numerous short-stalked capitate glands or sometimes, particularly in upper part of
211 stem, with short, appressed hairs instead. Leaves undivided and entire; basal leaves petiolate, spatulate and obtuse or oblanceolate and acuminate, 1–10 cm long and 2–12 mm wide; cauline leaves 2–10, 0.6–9.0 cm long and 1–15 mm wide, lanceolate, acute; lower leaves short-petiolate, others sessile. Capitulum 1.0–2.1 cm long and 1.8–4.3 cm wide; involucral bracts linearly lanceolate, acute, green, almost equal, 6–11 mm long and 0.5–1.5 mm wide. Ray florets pistillate, two-whorled, 7–16 mm long, of which 1.0–2.7 mm long tube covered above with rather long hairs; ligule flat, dark lilac, 0.8–1.7 mm wide, linearly oblong, with two small teeth at tip; disk florets 3.0–5.4 mm long, yellow, bisexual, tubular, five-toothed, with tube sparsely pubescent in middle; anthers and style branches exserted from open florets. Pappus two-rowed, outer bristles very short, inner scabrous, 3–5 mm long; achenes developing in all florets, oblanceolate, flat, about 3 mm long and 0.7 mm wide, sparsely pubescent with semi-appressed hairs. Flowering VI–IX. (Plate XIII, Fig. 3).

Mountains, in alpine meadows at 2,600–3,500 m. —*Caucasus*: Ciscaucasia; Dagestan; western, southern and eastern Transcaucasia. *General distribution*: Balkans-Asia Minor (Asiatic Turkey), Armenia and Kurdistan, Iran (northwest). Described from Armenia, possibly on the basis of a collection of Tournefourt in Turkish Armenia. The herbarium of Tournefourt is preserved in Paris.

Note. E. venustus Botsch. and *E. caucasicus* Stev. are equally widely distributed in the Caucasus. They belong to different sections. The former species belongs to section *Platyglossa* Botsch. and, as evident from the above-mentioned description, it represents a dwarf plant with a simple, single-headed stem bearing lanceolate leaves; its ligulate florets are flat and quite long, but the anthers and style branches are exserted from bisexual disk florets; it is found in alpine grassy meadows. The second species is from the section *Siphonoglossa* Botsch. It is a taller plant with a branched stem bearing several capitula and broad lanceolate leaves; its ligulate florets are considerably shorter and convoluted in a tube, but the anthers and style branches are not exserted from bisexual disk florets; it is found in alpine and subalpine meadows. Examining the herbarium material of these species, we find that a considerable proportion of the specimens, coming from all regions where our species are found, has different combinations of characters of the two species, i.e., it represents their hybrids. The most common bybrid specimens, with long flat ligules characteristic of *E. venustus* Botsch., are much taller than this and have broad lanceolate cauline leaves and usually a branched stem with two or more capitula, i.e., they have a number of characters similar to *E. caucasicus* Stev. Hybrids of *E. venustus* Botsch. with *E. caucasicus* Stev. were described under the name *E. raddeanus* Vierh. in the *Bull. Mus. Géorg.* VI (1939) 120. There also [page 122] is described *E. schelovnikovii* Vierh. —a hybrid of *E. venustus* Botsch. with *E. uniflorus* L., as well as two varieties of our species. viz. *E. venustus*
212 var. *typicus* Vierh. and *E. venustus* var. *glanduloso-hirsutus* Vierh. (page 117).

10. **E. silenifolius** (Turcz.) Botsch. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVI (1954) 392. —*Aster silenifolius* Turcz. in DC. Prodr. V (1836) 227; VII, 272; Ldb. Fl. Ross. II, 473.

Perennial. Rhizome branched many-headed, with short and slender branches. Stems usually many, leafy, simple, one-headed, erect, 5.5–28.0 cm high and 1.0–2.5 mm thick, basally pubescent like leaves and involucral bracts with short, somewhat stiff, multicellular, appressed or erect hairs, denser below capitulum and on involucral bracts, sometimes stem also glandular-hairy above with short-stalked capitate glands, very rarely plant glabrous. Leaves undivided and entire, green; basal leaves narrow, linearly lanceolate, gradually narrowed into petiole, 2–12 cm long and 1.5–9.0 mm wide; cauline leaves acute, 3–11, 0.8–9.0 cm long, 0.5–4.0 mm wide; lower leaves narrowly linear, short-petiolate; upper leaves linear, sessile. Capitulum 1–2 cm long and 1.8–3.5 cm wide; involucral bracts linearly lanceolate, acute, 0.7–1.0 mm wide and 6.0–8.5 mm long (outer bracts slightly shorter than inner). Ray florets pistillate, 22–44, two-whorled, 9.2–16.0 mm long (of which 2.3–3.5 mm long tube sparsely pubescent); ligules 0.9–2.7 mm wide, flat, obliquely spreading, linear, with two or three small teeth at tip, lilac; disk florets yellow, bisexual, tubular, five-toothed, 4.0–5.5 mm long, with tube sparsely pubescent in middle with appressed hairs. Pappus two-rowed, outer bristles very short, inner 4–6 mm long; achenes developing in all florets, linearly lanceolate, somewhat flat, about 2.7 mm long and 0.6 mm wide, pubescent with appressed, very long, somewhat stiff hairs. Flowering VII–VIII.

Outcrops of limestones and on sandy-rubbled slopes, sandy river banks.—*Arctic*: Arctic Siberia (Poligai River); *European Part*: Dvina-Pechora (northern Urals); *Eastern Siberia*: Yenisei (lower reaches of the Nizhnaya Tunguska River); Lena-Kolyma (from the lower reaches of the Khatanga and Lena rivers up to the region between the Olekma and Vitim rivers in the south and the Indigirka River in the east). Endemic. Described from eastern Siberia (between Yakutsk and Okhotsk). Type in Leningrad.

Note. Trautvetter in *Tr. Bot. Sada* V (1877) 66 described three varieties of our species (v. *glabrata* Trautv., v. *pubescens* Trautv., and v. *villosa* Trautv.), pointing out only that the varying degree of pubescence is characteristic of this species.

11. **E. koraginensis** (Kom.) Botsch. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVI (1954) 321. —*Aster koraginensis* Kom. Fl. p-ova Kamch. III (1930) 125.—*A. consanguineus* f. *flor. albis* Hulten in
213 Kungl. Sv. Vet. Acad. Handl., ser. III, 8, 2 (1930) 157. —*A consanguineus* auct. non Ldb.: Onno in Bibl. Bot. 106 (1932) 20, p. p.

Perennial. Stem solitary to many, erect, herbaceous, simple, single-headed, 9–23 cm high, green, sometimes violet above, leafy, with rather long, erect, multicellular hairs, denser above and usually with dark colored septa; long hairs in upper part of stem mixed with scattered, short-stalked capitate glands or short, appressed hairs. Leaves undivided and entire; basal leaves and those in sterile rosette oblanceolate, acute or spatulate, 1–7 cm long and 3–8 mm wide, with rather long, erect, multicellular hairs along margin and veins, upper leaves sometimes with dark transverse septa of hairs. Capitula 2.2–2.8 cm wide and 1.1–1.4 cm long; involucral bracts 5.5–8.0 mm long and 0.7–1.0 mm wide, linearly lanceolate, acute, usually violet, with rather dense, long, fine, intertwined, multicellular hairs having almost always dark transverse septa. Ray florets pistillate, two-whorled, 8.0–11.5 mm long (of which tube about 1.5 mm long and sparsely pubescent with appressed hairs); ligules white, flat, 1.0–1.7 mm wide, linear, acuminate, two- or three-toothed. Disk florets bisexual, tubular, five-toothed, 3.5–4.0 mm long, tube sparsely pubescent in middle with appressed hairs. Pappus two-rowed, inner bristles 3.0–3.5 mm long; achenes oblanceolate, flat, pubescent above with appressed hairs. Flowering VII–VIII.

River valleys, in meadows. *Arctic*: Anadyr; *Far East*: Okhotsk, Kamchatka. Endemic. Described from Kamchatka (Cape Ugolnyi). Type in Leningrad.

12. **E. komarovii** Botsch. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVI (1954) 321.—*Aster consanguineus* Ldb. Fl. Ross. II (1845–1846) 473. —*Erigeron alpinus* var. *pulchellus* Trautv. in Tr. Bot. Sada V (1877) 68. —*E. consanguineus* Kitamura in Mem. Coll. Sc. Kyoto Univ., ser. B, XIII (1937) 374 in syn. —*E. consanguineus* Novopokr. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, VII (1938) 137, non Cabrera (1937). —*Aster consanguineus* acut. non Ldb.: Hulten in Kungl. Sv. Vet. Acad. Handl., ser. III, 8, 2 (1930) 156, p. p.; Kom. Fl. p-ova Kamch. III (1930) 123, p. p.; Onno in Bibl. Bot. 106 (1932) 20, p. p.

Perennial. Herb with short branched rhizome, pubescent; hairs in pubescence rather long, multicellular, erect, scattered, straight or flexuous on stem below and both sides of leaves, but more dense along leaf margin and petioles, mixed in upper part of stem with short-stalked, capitate glands, below capitulum and on involucral bracts hairs darker, 214 soft, denser and intertwined, usually with dark septa. Stems many, straight, leafy, one-headed, simple, 4–26 cm high and 1.0–2.5 mm thick at base. Leaves undivided and entire; basal leaves petiolate, obovate, spatulate, obtuse, or oblanceolate and acute, 2.0–6.5 cm long and 3–15 mm wide; cauline leaves one to five, 1.0–3.7 cm long and 1–8 mm wide; lower cauline leaves short-petiolate, oblanceolate, acute, upper sessile, linearly lanceolate, acute. Capitula 2–4 cm wide, 9–17 mm long; involucral bracts linearly lanceolate, acute, 6–10 mm long and 0.8–1.6 mm wide, outer slightly shorter than inner. Ray florets two-whorled, pistillate, 7.5–15.0 mm long (of which tube about 2 mm long and sparsely pubescent with appressed hairs); ligules flat, lilac, violet or white, 1–2 mm wide, linear, three-toothed at tip; disk florets yellow, bisexual, tubular, five-toothed, 3.0–4.8 mm long, tube sparsely pubescent in middle with appressed hairs. Pappus two-rowed, outer bristles very short, inner 2.5–4.7 mm long; achenes oblanceolate, flat, somewhat densely pubescent with appressed hairs. Flowering VII–IX.

Mountains, on rocks, grassy alpine meadows, riverbanks. —*Arctic*: Arctic Siberia, Chukotka, Anadyr, Wrangel Island; *Eastern Siberia*: Lena-Kolyma; *Far East*: Kamchatka. Endemic. Described from Karaginskii Island. Type in Leningrad.

Note. E. komarovii Botsch. differs from the other brightly colored species of the series *Pulchellae,* viz. *E. thunbergii* A. Gray, with which it usually has been confused mainly by its soft intertwined hairs. The other character distinguishing them is less clear. If *E. thunbergii* has blue ligules, then *E. komarovii* Botsch. varies in this character, which may be due either to the poor preservation of the material or to the need to split *E. komarovii* Botsch. into several species. Some of the preserved plants now taken as *E. komarovii* Botsch. have lilac ligules (e.g., from the Kronotskii Pass region between the Lena and Olenek rivers), others have traces of violet (e.g., those from Wrangel Island, Anadyr), some have white ligules (e.g., from the mouth of the Lena River, Tiksi Bay), and many have lost their color completely. For this reason, nothing can be said definitely about the color of the ligules of the type specimens (Martens, Karaginskii Island), because they have faded; Ledebour also did not mention the color of the florets in his own description. Thus, only new collections from all parts of the range of the species, on which the color of the florets has been well-preserved, can make it possible to assess this character. Only then will it be possible to say that *E. komarovii* Botsch. is either relatively homogenous or varies uniformly throughout its range; or else we have here a case of several, different-colored, allied species, as had already been found in Soviet Central Asia, where in an area considerably smaller than in Siberia several allied but different-colored species grow.

13. **E. thunbergii** A. Gray in Mem. Amer. Acad. nov. ser. VI (1858–
215 1859) 395; Botschantzev in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVI, 390. —*Inula dubia* Thunb. Fl. Jap. (1784) 318. —*Aster japonicus* Less. Syn. gen. comp. (1832) 182. —*Erigeron dubius* Makino in Bot. Mag. Tokyo XVIII (1904) 18, non Spreng. (1826).—*Aster dubius* Onno in Bibl. Bot. 106 (1932) 21 nom. provis., non Krause (1905). —*A. consanguineus* auct., non Ldb.: Hulten in Kungl. Sv. Vet. Acad. Handl., ser. III, 8, 2 (1930) 156, p. p.; Kom. Fl. p-ova Kamch. III (1930) 123, p. p.; Onno in Bibl. Bot. 106 (1932) 20, p. p. —**Ic.**: Makino, Somoku Dzusetsu, ed. 3, XVII, t. 5 (sub. *E. dubius* Makino); Sugawara, Ill. Fl. Sagh. IV, tab. 812 (sub. *A. dubius* Onno).

Perennial. Rhizome short, branched. Stems usually many, erect, herbaceous, green, simple, single-headed, leafy, 6–30 cm high, with erect, multicellular, rather long and somewhat stiff hairs, sparse in lower part of stem and rather dense above, particularly below capitulum;

long hairs in upper part of stem mixed with fine, short, appressed hairs. Leaves green, undivided and entire, with occasional erect, multicellular, rather long, somewhat stiff hairs, mainly beneath and along margin; basal leaves and those in sterile rosette more or less long-petiolate, obovate, obtuse or more often oblanceolate and acuminate, 1.5–14.0 cm long and 3–18 mm wide; cauline leaves 3–9, 0.4–8.5 cm long and 1–11 mm wide, lanceolate or linearly lanceolate, cuspidate, sessile or lowermost leaves on short petiole. Capitulum 2.3–4.5 cm wide; 1.1–2.1 cm long; involucral bracts almost equal, linearly lanceolate, cuspidate, herbaceous, green, 7–11 mm long and 1.0–1.5 mm wide, with somewhat stiff, dense, long erect, multicellular hairs. Ray florets pistillate, two-whorled, 10–18 mm long (1.5–2.0 mm long tube sparsely pubescent with appressed hairs); ligules blue, 1.5–2.5 mm wide, flat, linear, two- or three-toothed at tip; disk florets bisexual yellow, tubular, five-toothed, 3.5–4.5 mm long, tube sparsely pubescent with appressed hairs. Pappus two rowed, outer bristles very short, inner 3.0–4.3 mm long; achenes about 3 mm long, oblanceolate, flat, pubescent with appressed stiff hairs.

Rocks, stony slopes, alpine meadows. —*Arctic*: Chukotka, Anadyr; *Far East*: Kamchatka, Okhotsk, Sakhalin Island, Kuril Islands. *General distribution*: Japan. Described from Japan. Type in Uppsala.

Series 3. Litorales Botsch. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVI (1954) 389.—Semishrubs with branched caudex. Stems branched, leafy. Leaves coarsely serrate; cauline leaves semiamplexicaul. Pubescence of multicellular hairs and short-stalked capitate glands. Ligu-
216 late florets two-whorled; ligules pale violet, flat. Lobes or teeth of yellow disk florets covered with almost sessile, capitate glands. Growing on rocks along seacoasts.

14. **E. oharai** (Nakai) Botsch. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVI (1954) 389. —*Aster oharai* Nakai in Bot. Mag. Tokyo XXXII (1918) 110.—*Heteropappus krylovianus* Kom. in Bot. Mat. Gerb. Gl. Bot. Sada VI (1926) 14.—*Aster litoralis* Kom. in Kom. and Alis. Opredel. Rast. Dalnevost. Kr. II (1932) 1012. —*Heteropappus oharai* Kitamura in Acta Phytotax. Geobot. II (1933) 44.—*Aster spathulifolius* auct. non Maxim.: Kitamura in Mem. Coll. Sc. Kyoto Univ. XIII (1937) 368, p. p.—**Ic.**: Nakai, Fl. sylv. Kor. XIV (1923) tab. 28 and 29.

Perennial. Semishrubs with somewhat branched, readily detachable, woody caudex bearing clusters of leaves at branch tips and usually few upcurved, leafy relatively thick (0.3–0.5 cm), low (20–40 cm) stems with solitary capitula on numerous branches (up to 10 capitula on stem). Leaves of sterile rosettes and at base of stem broadly oblanceolate or

obovate, with hollow acuminate-tip, comparatively short, winged petiole, along margin coarsely and sparsely acutely serrate-toothed, 3.5–13.5 cm long and 2.5 cm wide; middle cauline leaves broadly oblanceolate or obovate with hollow acuminate, apex sessile, semiamplexicaul, with numerous or solitary, sharp teeth in upper half; upper cauline leaves oblanceolate, sessile, with hollow acuminate apex, entire, 0.7–5.0 cm long and 0.2–2.5 cm wide; stems, branches, and involucral bracts (outer bracts over entire surface and along margin, but inner bracts only at apex) grayish-green due to rather dense pubescence of comparatively short, erect, soft, articulate hairs and short-stalked, capitate glands. Capitulum with ligules about 3.5 cm wide; outer involucral bracts about 1.5 and inner about 1 mm wide, with narrow membranous fringe along margin. Ray florets pistillate, pale-violet, two-whorled, flat, not convolute into tube even after drying, 16.5 mm long and 1.7 mm wide, linearly lanceolate, with three small, acute teeth at tip, tube about 2.8 mm long, sparsely pubescent with erect hairs; style branches two or three, linearly lanceolate. Disk florets bisexual, numerous, yellow, tubular, five-toothed, about 5.5 mm long, tube with solitary erect, short hairs in middle, but on lobes with few capitate, almost sessile glands; anthers exserted from florets; style branches broadly linear with broadly-cuneate, acute tips. Pappus two-rowed, outer bristles very short, inner about 4 mm long; achenes lanceolate, somewhat densely
217 pubescent with stiff, rather long, semi-appressed hairs, developing in all florets. Flowering IX. (Plate XIII, Fig. 1).

Gravel-beds and rocks of the seacoast. —*Far East*: Ussuri. *General distribution*: Korea. Described from Korea. Type in Tokyo.

Series 4. Eriodontae Botsch. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVI (1954) 388. —Herbaceous perennials with rather long, underground shoots. Stems simple, single-headed. Leaves entire; pubescence of long multicellular hairs mixed with more or less long-stalked capitate glands. Ligulate florets two-whorled, with blue flat ligules; teeth or lobes of yellow bisexual disk florets pubescent.

15. **E. flaccidus** (Bge.) Botsch. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVI (1954) 388. —*Aster flaccidus* Bge. in Mém. Acad. Sc. Pétersb. sav. étr. II (1835) 599; Ldb. Fl. Ross. II, 473; Turcz. Fl. baic.-dah. II, 8. —*A. argunensis* DC. Prodr. V (1836) 227. —*A. intermedius* Turcz. ex DC. Prodr. VII (1838) 272 sub. syn. and in herb. p. p. —*A. flaccidus* auct., non Bge: Onno in Bibl. Bot. 106 (1932) 62, p. p. excl. syn. *A. heterochaeta* Clarke, *A. glarearum* Farrer, and *A. kansuensis* Farrer; Kryl. Fl. Zap. Sib. XI, 2663, p. p.

Perennial. Herb with rather long underground shoots, developing rosettes of leaves and solitary stem at apex. Stems simple, single-headed, straight, 7.5–37.0 cm high, 1.2–3.5 mm thick, with sparse or denser pubescence of colorless, multicellular, long, flexuous, soft hairs (sometimes in upper part of stem hairs with dark septa) and few dark, erect, rather long-stalked capitate glands. Leaves green, densely or sparsely pubescent on both sides and along margin with colored, fine, usually flexuous, multicellular hairs, entire; basal leaves elliptical, obtuse, and rather long-petiolate or oblanceolate, acuminate, and short-petiolate, 2.5–11.5 cm long and 0.6–3.4 cm wide; cauline leaves two to nine, semiamplexicaul, 1.3–10.0 cm long and 0.1–2.4 cm wide, lower leaves lanceolate, acute, sessile, sometimes short-petiolate, upper leaves linearly lanceolate, acute, sessile. Capitula with ligules 4.2–8.0 cm wide and 2.5–4.0 cm long; involucral bracts dark-colored, 8–10 mm long and 2.0–2.2 mm wide, lanceolate, acute, more or less equal, not longer than disk, rather densely pubescent with long, soft, flexuous, colorless, multicellular hairs. Ray florets two-whorled, pistillate, 24–35 mm long (of which about 1.5 mm tube sparsely pubescent), ligules flat, blue, drooping after flowering, 1.7–2.0 mm wide, two-toothed at tip; disk florets bisexual, tubular, five-toothed, yellow, 6–8 mm long, pubescent in middle 218 of tube and on lobes with somewhat long, scattered, appressed hairs; style branches of bisexual florets about 2 mm long. Pappus two-rowed, outer bristles short, inner 5.5–6.5 mm long; achenes oblanceolate, flat, about 4 mm long and 1.3 mm wide, sparsely pubescent with rather long, appressed hairs, developing in all florets. Flowering VI–VIII.

Mountains, in alpine zone, meadows, stony slopes, moraines, moss-lichen tundra. *Western Siberia*: Altai; *Eastern Siberia*: Lena-Kolyma, Angara-Sayans, Dauria. *General distribution*: Mongolia. Described from the Altai. Type in Leningrad.

16. **E. heterochaeta** (Benth. ex Clarke) Botsch. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR XVI (1954) 388. —*Heterochaeta asteroides* DC. Prodr. V (1836) 282, p. p. —*Aster heterochaeta* Benth. ex Clarke Comp. Ind. (1876) 44; Hook. Fl. Brit. Ind. III, 250, p. p. excl. pl. altaicae; O. and B. Fedtsch. Perech. Rast. Turk. IV, 158. —*A. flaccidus* auct., non Bge: Onno in Bibl. Bot. 106 (1932) 62, p. p. quo ad syn. *A. heterochaeta* Clarke; Rech. f. in Dan. Biol. Scr. (Symbolae Afghanicae II, 8, 2 (1955) 5).

Perennial. Herb, usually forming loose mat with short underground shoots, developing rosettes of leaves and solitary stem at apex. Stem simple, single-headed, straight, 3–20 cm high, 1.3–2.0 mm thick, sparsely or more or less densely pubescent with long, colorless, flexuous, multicellular hairs mixed with few, dark, erect, short-stalked, capitate, glandular hairs. Leaves undivided and entire, green or almost glabrous, pubescent only along margin at apex, or on both surfaces and along margin, sometimes densely, sometimes sparsely, with rather long, flexuous, colorless, multicellular hairs; basal leaves short-petiolate, obtuse, obovate, and oblanceolate or almost sessile, acute, lanceolate, 1.2–6.5 cm long and 0.4–2.0 cm wide; cauline leaves one to four, sessile, acute, 0.7–4.2 cm long and 0.5–11.0 mm wide, lower leaves lanceolate, upper linear. Capitulum with ligules 2.7–5.0 cm wide and 1.5–2.8 cm long; involucral bracts 7–10 mm long and 1.1–1.8 mm wide, lanceolate, acute, almost equal, not longer than disk, usually densely pubescent with colorless, somewhat long, intertwined, multicellular hairs. Ray florets pistillate, two-whorled, 12–21 mm long (of which about 1.5 mm long tube sparsely pubescent with appressed hairs), ligules flat, linear, with two or three small teeth at apex, blue, 1.0–2.6 mm wide; disk florets bisexual tubular, five-toothed, yellow, 4.5–7.0 mm long, pubescent in middle of tube and on lobes with somewhat long, scattered, appressed hairs; style branches of bisexual florets 1.0–1.6 mm long. Pappus two-rowed, outer bristles short, inner 4.5–9.0 mm long; achenes developing in all florets, flat, oblanceolate, about 4.7 mm long and 1.2 219 mm wide, sparsely pubescent with rather long, appressed hairs. Flowering VI–IX. (Plate XIII, Fig. 2).

Mountains, in alpine zone (2800–4700 m), grassy meadows, moraines, clayey and stony slopes. —*Soviet Central Asia*: Dzhungaria-Tarbagatai, Pamiro-Alai (Alai and Trans-Alai ranges, Pamir), Tien Shan. *General distribution*: Iran (Afghanistan), Indo-Himalayas, Dzhungaria-Kashgaria, Tibet. Described from the Himalayas. Type in London.

Note. In the note where I transferred *Aster heterochaeta* Benth., as a species, to the genus *Erigeron* L. (l. c..), an error crept in. There it was said that the ranges of *E. flaccidus* (Bge.) m. and *E. heterochaeta* (Benth.) are contiguous in the Narym Range. In fact, their ranges are not contiguous, but are separated in the Zaisan basin. The extreme southern point of distribution of *E. flaccidus* (Bge.) m. remains in the Narym Range, but *E. heterochaeta* (Benth.) m. reaches in its distribution in the north only up to the Mustau Mountains toward east of the Tarbagatai Range.

Section 2. SIPHONOGLOSSA Botsch. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVI (1954) 393. —Ligulate florets two- or three-whorled; ligules not recurved, in dried condition convoluted into tube; anthers not exserted from disk florets; pappus in all florets identical. Perennial herbs, less often biennials, pubescent with simple, fine or thick, hairs mixed with stalked, capitate glands or short, appressed hairs, very rarely entirely glabrous. Leaves entire.

Note. This is the most difficult group of species of the genus *Erigeron* L. to delimit and identify. It is due to the fact that many species of the section, particularly in Soviet Central Asia, hybridize not only among themselves, but also quite often with species of other sections of the genus. This group as a whole needs to be further studied in more detail.

Series 1. Coniformes Botsch. Capitula solitary, very rarely many; involucral bracts usually as long as disk; disk florets narrow conical. Leaves without ciliate pubescence. Herbaceous perennials with well developed rhizome.

17. **E. petiolaris** Vierh. in Beih. Bot. Centralbl. XIX, 2 (1906) 522; O. and B. Fedtsch. Perech. Rast. Turk. 4, 164; Popov in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, No. 7, 10. —*E. pseudoneglectus* M. Pop. in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, No. 7 (1948) 11.

Perennial. Rhizome short. Stems many, 5–28 cm high, 1–2 mm thick, straight, single-headed, green or reddish, leafy, with numerous, long, multicellular, erect and appressed small hairs. Leaves green, entire, 220 pubescent along margin and petiole, with numerous, long, multicellular erect hairs on both sides (very rarely basal leaves pubescent only along margin); basal leaves 1.5–15.0 cm long and 3–15 mm wide, oblanceolate, long-petiolate, obtuse or acuminate; cauline leaves 3–12, 0.7–7.2 cm long and 1–8 mm wide, lower leaves oblanceolate, petiolate, obtuse or acuminate, upper leaves lanceolate, acute, sessile. Capitula 9–13 mm long and 14–26 mm wide; involucral bracts longer than or as long as disk, appressed, 7–10 mm long and 0.7–1.0 mm wide, linearly lanceolate, acute, green or reddish at apex, covered with numerous, long, multicellular, straight, erect, stiff hairs. Ray florets pistillate, 4.5–9.5 mm long (of which tube 2.2–3.2 mm long), sparsely pubescent in upper part of tube; ligule pink, less often white, about 0.4 mm wide, after drying convolute into tube; disk florets bisexual, tubular, narrow-conical, five-toothed, 3.7–4.5 mm long, sparsely pubescent above. Pappus 4–5 mm long; achenes about 2 mm long and 0.4 mm wide, lanceolate, flat, densely pubescent with semiappressed, stiff hairs. Flowering VII–IX.

Mountains, forests, alpine and subalpine meadows. —*Western Siberia*: Altai; *Soviet Central Asia*: Dzhungaria-Tarbagatai, Pamiro-Alai, Tien Shan. *General distribution*: Dzhungaria-Kashgaria. Described from the Dzhungarian Alatau. Type in Leningrad.

Note. While establishing *E. petiolaris* Vierh., its author mentioned that he was naming the plant treated earlier as *Aster alpinus* var. *petiolaris* Winkl. However, M.G. Popov, in his review of the Soviet Central Asian

Erigeron L. species, noted that in the herbarium of the Botanical Institute of the Academy of Sciences of the USSR all plants annotated by K. Winkler as *Aster alpinus* var. *petiolaris* Winkl. in fact belong to *A. alpinus* L. and not to the genus *Erigeron* L.

In the herbarium of the Botanical Institute of the Academy of Sciences of the USSR, I tried to find duplicates of the authentic specimens cited by Vierhapper in establishing *E. petiolaris* Vierh., because the fate of the authentic specimens of this species preserved in Berlin is unknown. In establishing this species, Vierhapper cited two plants. A duplicate of one of them (Brotherus, Kungei Alatau Kokvirok, 1898) was found to be typical *E. lachnocephalus* m. (= *E. turkestanicus* Vierh.) because, like the latter, it has dark-colored involucral bracts, which are pubescent with intertwined yellowish hairs. Vierhapper's other authentic specimen had the following label: "Alatau, C.A. Meyer, 1841." Alatau obviously refers to the Dzhungaria Alatau. As is well known, C.A. Meyer had not been in the Dzhungarian Alatau, and in 1841 he was not even 223 near it. Apparently, the plant originated either from Schrenk or from Karelin, who had been in the Dzhungarian Alatau in those years.

Among the plants of Schrenk in the herbarium of the Botanical Institute of the Academy of Sciences of the USSR there is only one plant that corresponds to the concept of *E. petiolaris* Vierh. and has the label "Alatau," but it was collected in 1840.

Here, too, among Karelin's plants there are specimens with the label "Alatau, 1841," which correspond completely to the characteristics of *E. petiolaris* Vierh. Thus, only the label of Karelin's plant agrees with the label of the authentic specimen if, of course, we concede that the collector was incorrectly cited by Vierhapper. On this basis, it is most appropriate to select, as the lectotype of *E. petiolaris* Vierh. Karelin's plants, which are preserved in the herbarium of the Botanical Institute of the Academy of Sciences of the USSR in Leningrad.

The complete label of the lectotype should be as follows (see, *Bull. Mosk. Obshch. Ispyt. Prir.*, 1842, 377, No. 422): "In alpinis herbidis Alatau ad fl. Lepsa. Fl. sub finem Junii et Julio 1841, No. 422, Karelin."

E. pseudoneglectus M. Pop. (l. c.) was published without designation of the type. Only a single herbarium sheet of this species annotated by M.G. Popov was at my disposal. I am recommending this sheet as the lectotype: "Northern slopes of the Talass Alatau. Koi-sai; meadow-forest zone, on gentle slopes. 8.VII.1922, No. 1361a, flowering E.P. Korovin" (preserved in the herbarium of the Soviet Central Asian State University in Tashkent).

In passing, I will correct the error overlooked in the description of this plant. It has been referred to subgenus *Trimorpha* (Cass.) M. Pop., because, supposedly, separate tubular female florets are characteristic of it. This was noted by M.G. Popov even on the herbarium sheet selected as the type of *E. pseudoneglectus* M. Pop. I have studied the type. All the female florets proved to be ligulate, but the ligules were rolled lengthwise into a tube. Hence, the plant does not belong to subgenus *Trimorpha* (Cass.) M. Pop., but to section *Siphonoglossa* Botsch. of subgenus *Euerigeron* (Boiss.) M. Pop.

Having correctly resolved the question of the position of this plant in the classification of the genus, we are convinced at the same time that *E. pseudoneglectus* M. Pop. was described superfluously. It is not at all different from *E. petiolaris* Vierh.

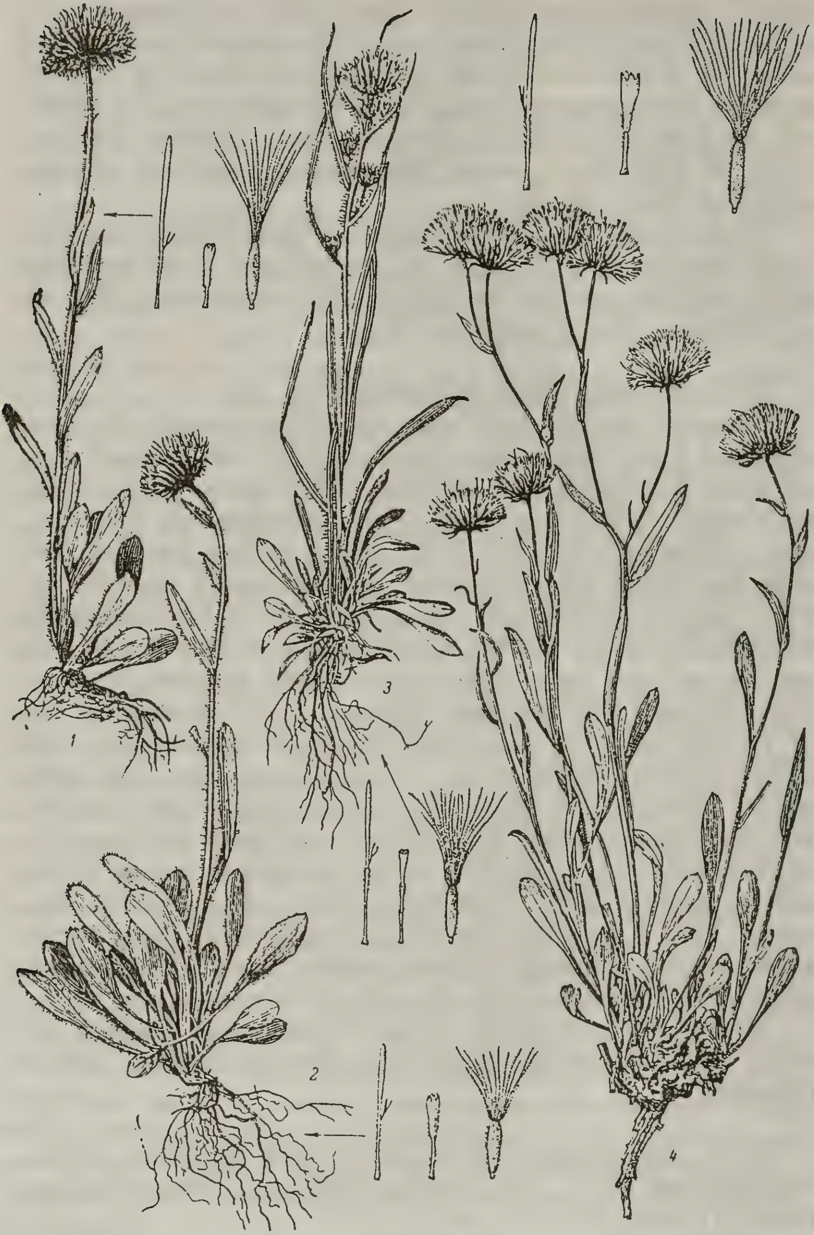
18. **E. plurifolius** Botsch. in Addenda XXIV, 583.

Perennial. Rhizome short. Stems one or two, straight, 15–25 cm high about 2 mm thick at base, sparsely covered with scattered erect, rather long, multicellular hairs and dense, stalked, capitate glands, simple, single-headed, leafy. Leaves entire, ciliately pubescent with rather long, erect, straight hairs, but with dense, stalked, capitate glands on both sides; basal leaves few, oblanceolate, petiolate, apically rounded, 1.5–5.5 cm long and 2–5 mm wide; cauline leaves 15–20; lower and middle 224 cauline leaves linearly spatulate, sessile, apically rounded, 2–5 cm long and 2–4 mm wide; upper cauline leaves linearly lanceolate, acute, 1–2 cm long and 1.0–1.5 mm wide. Capitulum 1.0–1.1 cm long and 2.0–2.5 cm wide; involucral bracts linearly lanceolate, long acuminate, dark colored, appressed, almost equal, 7–8 mm long and 0.8–1.2 mm wide, sparsely pubescent with stiff, erect, not very long, straight, colorless hairs. Ray florets pistillate, about 7.5 mm long; ligules pink, about 4.5 mm long and 0.3 mm wide, after drying convoluted to form tube; tube sparsely pubescent above. Disk florets yellow, tubular, conical, five-toothed, about 4 mm long, with tube sparsely pubescent above. Pappus bristles about 5 mm long, 25, bright, barbed. Young achenes densely pubescent with somewhat stiff, semi-appressed hairs. Flowering VII.

Scrubby tundra, riverbanks.—*Arctic:* Arctic Siberia, Chukotka. Endemic. Described from the Malyi Chaun River in Chukotka. Type in Leningrad.

19. **E. polymorphus** Scop. Fl. carn. II (1772) 160; Vierh. in Beih. Bot. Centralbl. XIX, 2, 474; Vierh. in Bull. mus. Géorgie VI, 119; Grossh. Fl. Kavk. Ed. 1, IV, 98.

Perennial. Stems solitary or many, straight, simple, single-headed, leafy, 4–25 cm high, sparsely covered with long, erect, multicellular hairs and dense, short, appressed hairs. Leaves entire, ciliately pubescent with long multicellular hairs, but with few, long, multicellular



221

Plate XIV.
Habit, ligulate ray floret, bisexual disk floret, achene:
1—*Erigeron eriocalyx* (Ldb.) Vierh.; 2—*E. humilis* Grah.; 3—*E. lonchophyllus* Hook.; 4—*E. pseuderiocephalus* M. Pop.

erect, scattered and appressed small hairs on both sides (particularly, cauline leaves); basal leaves oblanceolate, long-petiolate, obtuse, 1–7 cm long and 4–8 mm wide; cauline leaves three to eight, lanceolate, acute, sessile (lowermost leaves petiolate), 1.0–4.5 cm long and 1–5 mm wide. Capitulum 2–3 cm wide and 1.0–1.5 cm long. Involucral bracts as long as disk, linearly lanceolate, acute, with few long, straight, somewhat stiff, multicellular hairs; inner bracts 5.7–8.5 mm long and 0.7–1.0 mm wide, outer somewhat shorter. Ray florets pistillate, when dry convoluted to form tube, 4–10 mm long, sparsely pubescent in lower part of ligule and upper part of tube; ligules pink, 2.0–7.5 mm long and 0.4–0.5 mm wide. Disk florets bisexual, tubular, narrow-conical, five-toothed, yellow, 3–4 mm long, tube sparsely pubescent above with appressed hairs. Pappus two-rowed, outer bristles very short, inner 3.0–4.5 mm long; achenes oblongly lanceolate, flat, 2.2–3.0 mm long and 0.5 mm wide, covered with semi-appressed, short, somewhat stiff hairs. Flowering VII–VIII.

225 Mountains, moraines and grassy meadows, at 2,000–3,000 m. — *Caucasus*: Ciscaucasia. *General distribution*: Central Europe, western Mediterranean, Balkans-Asia Minor. Described from Kraina (Yugoslavia). Type in Ljubljana.

20. **E. schalbusi** Vierh. in Bull. mus. Géorgie VI (1931) 119; Grossh. Fl. Kavk., Ed. 1, IV, 97.

Perennial. Rhizome branched. Stems erect, 2.5–8.0 cm high and 1 mm thick, simple, single-headed, leafy, densely pubescent with erect, multicellular, and appressed small hairs. Leaves entire, green, rather densely pubescent with long, erect, multicellular hairs with few appressed hairs; basal leaves oblanceolate, obtuse or acuminate, long-petiolate, 0.7–5.0 cm long and 3–8 mm wide; cauline leaves two to four, broadly lanceolate, acute, sessile, 0.9–2.5 cm long and 2–5 mm wide. Capitulum 1.9–2.2 cm wide and 0.9–1.1 cm long. Involucral bracts slightly longer than disk, appressed, linearly lanceolate, acute, densely covered with straight, somewhat stiff, multicellular, erect, long hairs, green, apically reddish; inner bracts 7.0–7.5 mm long and 1 mm wide, outer slightly shorter. Ray florets pistillate, about 8 mm long (of which tube 2.5 mm long), with less numerous long, appressed hairs in upper part of tube and lower part of ligule; ligule white, linear, apically rounded, about 0.5 mm wide, convoluted when dry, forming a tube. Disk florets bisexual, tubular, narrow-conical, five-toothed, yellow, about 4.3 mm long. Pappus about 4.5 mm long; achenes immature, covered with somewhat stiff hairs. Flowering VII.

Mountains, alpine grassy meadows, at 2,500–4,100 m. —*Caucasus* Dagestan. Endemic. Described from Dagestan (Shalbus Mountain). Type in Tbilisi; isotype in Leningrad.

Note. The isotype of *E. schalbusi* Vierh. has still unopened florets. It is only after comparing the isotype with different specimens of this genus from Dagestan that one comes to the conclusion that it is related to the plants mentioned at his time by Boissier as a white-flowered variety of *E. uniflorus* L. The description of *E. schalbusi* Vierh. given here was prepared on the basis of these very plants collected by Ruprecht from the Bogosskoe Range in 1861.

21. **E. pallidus** M. Pop. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, VIII (1940) 51; Popov in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, No. 7, 10.

Perennial. Caudex not well developed, branched. Stems many, ascending or erect, 3–16 cm high, leafy simple, single-headed, or very rarely weakly branched, green or reddish, sparsely covered with long, 226 erect, multicellular and short, appressed hairs. Leaves entire, green, ciliately pubescent or on both sides, covered with scattered, long, erect, multicellular hairs; basal leaves linearly lanceolate, obtuse or acute, 0.9–9.0 cm long and 2–7 mm wide; cauline leaves three to seven, narrowly linearly lanceolate, acute, sessile, 0.6–2.7 cm long and 0.7–2.0 mm wide. Capitulum 1.3–2.8 cm wide and 9–13 mm long. Involucral bracts green, as long as disk, sparsely pubescent with somewhat stiff, erect, multicellular hairs; inner bracts 6.2–7.5 mm long and 0.6–1.0 mm wide, outer slightly shorter. Ray florets pistillate, about 7.5 mm long (of which 3 mm long tube), tube sparsely pubescent above with appressed hairs; ligule pale pink, 0.3–0.4 mm wide. Disk florets bisexual, tubular, narrow conical, five-toothed (lobes pink), 4.3–5.2 mm long, with occasional short, appressed hairs in middle. Pappus two-rowed, outer bristles very short, inner 4.3–5.2 mm long; achenes oblongly lanceolate, flat, 2.8 mm long, covered with semi-appressed, somewhat stiff hairs. Flowering VII–IX.

Mountains, rubble slopes and moraines, at 2,400–3,500 m.—*Soviet Central Asia*: Pamiro-Alai, Tien Shan. Endemic. Described from the Angren River (Tien Shan). Type in Leningrad.

22. **E. sogdianus** M. Pop. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, VIII (1940) 53; Popov in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, No. 7, 10.

Perennial. Rhizome short, branched. Stems many, green or reddish, erect or ascending, leafy (with two to eight cauline leaves) simple, single-headed, or branched with corymbose inflorescence, 2–18 cm high and 1.0–1.5 mm thick, sparsely or somewhat densely covered with soft, long, erect, multicellular hairs mixed with numerous short appressed hairs. Leaves green, entire, ciliate, or rather densely covered on both sides with soft, long, erect, multicellular hairs; basal and lower cauline leaves oblanceolate, obtuse, long-petiolate, 0.5–7.0 cm long and 2–14 mm wide; middle and upper cauline leaves lanceolate, acute, sessile, 0.5–3.5 cm long and 1–6 mm wide. Capitulum 1.2–1.7 cm wide, 7–12 mm long; involucral bracts as long as disk, linearly lanceolate, acute, green or with reddish apex, covered with colorless, fine, long, soft, intertwined, multicellular hairs, 6–10 mm long and 1 mm wide. Ray florets pistillate, 5.5–8.0 mm long (of which tube 2.5–3.5), with tube covered above with short, appressed hairs; ligules blue, 0.5 mm wide. Disk florets about 4 mm long, bisexual, tubular, conical, five-toothed, yellow or with blue lobes, covered in upper half with short, appressed hairs. Pappus two-rowed, outer bristles very short, inner 4–5 mm long; achenes lanceolate, flat, 3.0–3.2 mm long, densely pubescent with somewhat stiff, semi-appressed hairs. Flowering VI–IX.

227 Mountains, alpine and subalpine meadows, crevices of rocks, forest edges and moraines, at 2,400–4,200 m. —*Soviet Central Asia*: Pamiro-Alai. Endemic. Described from the Chulbair Mountains. Type in Tashkent.

23. **E. caucasicus** Stev. in Mém. Soc. Nat. Mosc. 4 (1813) 63, réimprimés (1830) 103; MB. Fl. taur.-cauc. III, 569; DC. Prodr. V, 293; Ldb. Fl. Ross. II, 486; Vierh. Bull. mus. Géorgie VI, 118; Grossh. Fl. Kavk. Ed. 1, IV, 98. —*E. amphibolus* Ldb. Fl. Ross. II (1845) 486; Boiss. Fl. Or. suppl. 288.

Perennial. Rhizome branched. Stems many, 6–50 cm high and 1.5–3.0 mm thick, erect or ascending, leafy, green, at base reddish, branched with corymbose inflorescence, less often simple and single-headed, rather strongly pubescent like leaves and involucral bracts with stiff, erect, long, straight, multicellular hairs besides, on stems and leaves, with considerable number of small, appressed hairs. Leaves entire, green; basal and lower cauline leaves oblanceolate, long-petiolate, acute, 2.5–10.0 cm long and 5–15 mm wide; middle and upper cauline leaves sessile, broadly lanceolate, acute or ovate and acuminate, 1–8 cm long and 1.5–16.0 mm wide (cauline leaves 5–16). Capitulum 2.5–3.5 cm wide and 1.2–1.7 cm long. Involucral bracts more or less as long as disk, linearly lanceolate, acute, green with reddish apex; inner bracts 7.2–8.0 mm long and 0.7–10 mm wide, outer slightly shorter. Ray florets pistillate, 9–10 mm long (of which 3 mm long tube), pubescent in upper part of tube and lower part of ligule with appressed hairs; ligule light or dark pink, about 0.5 mm wide, with round apex, convoluted when dry forming tube. Pappus two-rowed, outer bristles very short, inner 4.3–5.5 mm long; achenes oblongly lanceolate, flat, 2.8–3.1 mm long, densely covered with somewhat stiff, semi-appressed, rather long hairs. Flowering VII–IX.

Mountains, at 1,600–3,200 m, alpine and semi-alpine meadows, glacial moraines, rubble slopes and rocks. —*Caucasus*: All regions. *General distribution*: Armenia and Kurdistan. Described from the Caucasus. Type in Helsinki; isotype in Leningrad.

Series 2. Cylindraceae Botsch. Capitula solitary, very rarely many; involucral bracts more or less as long as disk; disk florets cylindrical or almost cylindrical, abruptly narrowed below into narrower cylindrical tube; leaves not ciliate pubescent. Perennial herbs with well developed rhizome.

24. **E. uniflorus** L. Sp. pl. (1753) 864; Ldb. Fl. Ross. II, 490, p. p.; Boiss. Fl. Or. III, 165; Grossh. Fl. Kavk. Ed. 1, IV, 98.

228 Perennial. Rhizome branched. Stems many, erect or ascending, green or reddish, leafy, simple, single-headed, 1.5–15.0 cm high; and 0.75–1.5 mm thick, sparsely covered with soft, long, erect, multicellular hairs, mixed with short, multicellular, appressed hairs. Leaves entire, green, sparsely covered with long, soft, erect, multicellular hairs; basal leaves oblanceolate, obtuse, long-petiolate, 1.0–4.5 cm long and 2–11 mm wide; cauline leaves two to eight, 0.7–4.0 cm long and 1–7 mm wide. Capitulum 1.5–2.8 cm wide and 0.8–1.3 cm long. Involucral bracts more or less as long as disk, lax, recurved, linearly lanceolate, acute, reddish, 6–10 mm long and 1.0–1.2 mm wide, densely covered with colorless, soft, intertwined, long, multicellular hairs. Ray florets pistillate, 6–8 mm long (of which 2.5 mm tube), with tube covered throughout with short, appressed hairs; ligules pink, rotund, 0.3–0.6 mm wide, convoluted when dry forming a tube. Disk florets bisexual, tubular, cylindrical or almost so, narrowed below into narrower cylindrical tube, five-toothed with pink lobes, with occasional hairs in upper part of tube, 3.5–4.3 mm long. Pappus two-rowed, outer bristles very short, inner 3.5–4.3 mm long; achenes oblongly lanceolate, flat, 2.7–3.0 mm long, densely covered with more or less long, stiff, semi-appressed hairs. Flowering VII–VIII.

Mountains, in alpine meadows, moraines, forest edges and rocks, at 2,500–3,700 m. —*European Part*: Upper Dniester?; *Caucasus*: All regions. *General distribution*: Central Europe, western Mediterranean, Balkans-Asia Minor, Armenia and Kurdistan. Described from Switzerland and Sweden. Type in London.

25. **E. eriocalyx** (Ldb.) Vierh. in Beih. Bot. Centralbl. XIX, 2 (1906) 512; O. and B. Fedtsch. Perech. Rast. Turk. 4, 164; Popov in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, No. 7, 10; Krylov, Fl. Zap. Sib. XI, 2682. —*E. alpinus* β. *eriocalyx* Ldb. Fl. alt. IV (1833) 91. —*E. uniflorus* auct., non L. (1753); Ldb. Fl. Ross. II, 2 (1845–46) 490, p. p.

Perennial. Rhizome short, branched; stems usually many, erect, herbaceous, simple, single-headed, green or reddish, leafy, 4.0–33.5 cm high and 1–2 mm thick, covered with soft, long, erect, multicellular hairs, and very short, appressed hairs, denser above. Leaves green, entire, pubescent along margin and petiole, very rarely on both sides, with long, soft, multicellular hairs; basal leaves 1.0–9.5 cm long and 2–13 mm wide, oblanceolate, long-petiolate, obtuse or acuminate; cauline leaves 4–10, 0.6–7.5 cm long and 1–12 mm wide, lower leaves like basal leaves, upper lanceolate, acute, sessile. Capitulum 9–14 mm long and 1.9–3.2 cm wide. Involucral bracts more or less as long as disk, many rowed, dark (reddish), linearly lanceolate, long acuminate, appressed, densely pubescent with fine, long, intertwined, multicellular 229 hairs with dark-colored septae; inner bracts 5–9 mm long and 0.6–1 mm wide, outer slightly shorter. Ray florets pistillate, 7–10 mm long, of which tube about 2 mm; ligules violet, rarely lilac, very rarely white, about 0.5 mm wide, convoluted when dry forming tube, with less numerous, short, appressed hairs below. Disk florets bisexual, tubular, cylindrical, narrowed below into narrower cylindrical tube, five-toothed (lobes of same color as that of ligules), 3.2–4.1 mm long, tube sparsely pubescent above. Pappus two-rowed, outer bristles very short, inner 3.6–4.3 mm long; achenes developing in all florets, lanceolate, flat, 2.5–2.7 mm long and 0.6 mm wide, covered with semi-appressed, somewhat stiff, not very long hairs. Flowering VII–VIII. (Plate XIV, Fig. 1).

Tundra meadows, alpine zone of mountains, grassy meadows and slopes. —*Arctic*: Arctic Europe (Pai-Khoi Range), Arctic Siberia (Polar Urals); *European Part*: Dvina-Pechora (Urals); *Western Siberia*: Ob Region, Altai; *Eastern Siberia*: Yenisei, Angara-Sayans, Dauria. *General distribution*: Scandinavia, Dzhungaria-Kashgaria, Mongolia. Described from the Altai. Type in Leningrad.

Note. Seven different plant specimens are mounted on the herbarium sheet that was selected as the type of *E. eriocalyx* (Ldb.) Vierh. These plants are heterogenous. Therefore, it is necessary to select from them the ones that would be characteristic of the species and thus should be the type. Out of all specimens only two completely fit the name and characteristics of the species given by Ledebour in the few words of the original description (involucral bracts lanate-villous, etc.) as well as the concept of *E. eriocalyx* (Ldb.) Vierh., developed after study of material from its entire geographic range (involucral bracts dark-colored, hairs of bracts with dark septa, leaves broad, glabrous, etc.). I propose to select these two specimens as the type of *E. eriocalyx* (Ldb.) Vierh. The other specimens on the herbarium sheet have rather coarse, spreading, straight or slightly flexuous hairs without dark septa on the dark-colored involucral bracts, and some specimens, in addition, are pubescent on the leaf surfaces as well, i.e., the specimens are characterized by features not typical of *E. eriocalyx* (Ldb.) Vierh. It is most probable that these are hybrids of *E. eriocalyx* (Ldb.) Vierh. and *E. petiolaris* Vierh. whose ranges coincide in the Altai.

A few words about the distribution of *E. eriocalyx* (Ldb.) Vierh. beyond the limits of the *Flora of the USSR*. There cannot be any doubt about its distribution over the areas of China and Mongolia adjoining Siberia and Soviet Central Asia. But its distribution in Scandinavia requires explanation. It was thought that out of the closely related species only *E. uniflorus* L. is reported from Scandinavia. Apparently, 230 however, some of these specimens belong to *E. alpiniformis* Cronq. described from Greenland (cf., Botschantzev in *Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR*, XVI, 1954, 393). The remaining and greater part of the Scandinavian plants, previously determined as *E. uniflorus*, but having dark, long-acuminate involucral bracts with hairs with dark septa, can be identified only with E. eriocalyx (Ldb.) Vierh. because *E. uniflorus* L. s. str. (cf., Vierhapper in *Beih. Bot. Centralbl.* XIX, 2, 1906, 510) has white hairs (without colored septa) on the involucral bracts.

Thus, *E. eriocalyx* (Ldb.) Vierh. has three disjunct pockets of distribution: Scandinavia, Ural-Taimyr and Altai-Mongolian.

26. **E. lachnocephalus** Botsch. nom. nov. —*E. turkestanicus* Vierh. in Beih. Bot. Centralbl. XIX, 2 (1906) 522, non O. Fedtsch. (1903); O. and B. Fedtsch. Perech. Rast. Turk. 4, 165; Popov in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, No. 7, 10.

Perennial. Rhizome short, branched. Stems many, erect or ascending, herbaceous, simple, single-headed, leafy, green or reddish, densely pubescent (sometimes almost villous) with long, multicellular, erect hairs mixed with short, appressed hairs. Leaves entire, green or grayish, pubescent (sometimes very densely) on both sides with long, multicellular hairs; basal leaves oblanceolate, petiolate, obtuse or acuminate, 1–7 cm long and 2–9 mm wide cauline leaves four to eight, lanceolate, acute, sessile (lower leaves short-petiolate), 0.7–4.0 cm long and 1–8 mm wide. Capitula 1.7–3.5 cm wide and 0.8–1.7 cm long. Involucral bracts equal, longer than disk, lax, recurved, 7.0–9.5 mm long and 0.8–1.1 mm wide, linearly lanceolate, acute, reddish, pubescent with yellowish, soft, woolly, multicellular, intertwined hairs. Ray florets pistillate, 7.2–8.5 mm long (of which tube 2.7 mm), tube with occasional short, appressed hairs above; ligules pink or lilac, not lobed, about 0.6 mm broad. Disk florets 3.5–3.8 mm long, bisexual, tubular, cylindrical, narrowed below into narrower cylindrical tube, sparsely pubescent above with appressed hairs, five-toothed, with lobes of same color as ligules. Pappus two-rowed, outer bristles very short, inner about 4.3 mm long;

achenes about 2.1 mm long and 0.5 mm wide, covered with somewhat stiff, semi-appressed hairs. Flowering VI–VIII.

Mountains, stony slopes and moraines, rocks, snow patches and alpine meadows, at 2,500–3,600 m. —*Soviet Central Asia:* Dzhungaria-Tarbagatai, Pamiro-Alai, Tien Shan. *General distribution:* Dzhungaria-Kashgaria. Described from the Kirghiz Alatau. Type in Leningrad.

231 *Note.* Among authentic specimens of *E. turkestanicus* Vierh., several plants have been cited from different localities where E. Regel and Fetissow collected during 1879–1880 in the Tien Shan within the limits of present-day Kazakhstan, Kirgizia and Sinkiang (China). It would have been most appropriate to select as the type specimen the plant preserved in Berlin and cited by Vierhapper under the label: Mont Alexander 9000–10000 ft (Fetissow, 1880), because, probably, it totally agrees with Vierhapper's concept of this species and originates from the center of its geographical range. The fate of the Berlin material is unknown, but the specimen preserved in Leningrad has the label: "Dschilamysch, m. Alexander, 9000 ft, Fetissow, 26 VI 1880." It must be designated as the lectotype of *E. turkestanicus* Vierh.

E. turkestanicus Vierh. (1906) is a later homonym of *E. turkestanicus* O. Fedtsch. (1903), based on another type, and it is a synonym of *E. cabulicus* (Boiss.) Botsch. Therefore, the plant earlier named *E. turkestanicus* Vierh. is being given a new name here —*E. lachnocephalus* Botsch.

27. **E. petroiketes** Rech. f. in Dan. Biol. Ser. (Symb. Afghanicae II) 8, No. 2 (1955) 8, fig. 3 and 8a; Botschantzev in Bot. Zhurn. 42, No. 5, 773.

Perennial. Rhizome short. Stems many, 2–22 cm high and 1.0–2.5 mm thick, erect or ascending, green or reddish, leafy (with 2–11 cauline leaves), simple, single-headed, sparsely or densely covered with long, erect, multicellular and short, appressed hairs. Leaves entire, green or grayish, ciliate-pubescent or with long, erect, multicellular hairs on both sides; basal and lower cauline leaves oblanceolate, obtuse, long-petiolate, 0.5–9.5 cm long and 1–10 mm wide; middle and upper cauline leaves lanceolate, acute, sessile, 0.6–5.0 cm long and 0.5–8.0 mm wide. Capitulum 1.0–2.8 cm wide and 6–15 mm long. Involucral bracts as long as or somewhat shorter than disk, 4–10 mm long and 0.5–1.2 mm wide, linearly lanceolate, acute, green or with reddish apex, appressed, densely (very rarely sparsely) pubescent with yellowish, coarse, long, flexuous, multicellular hairs. Ray florets pistillate, 4.5–7.7 mm long (of which tube 2.0–2.5 mm), tube pubescent above with appressed hairs; ligule blue, about 0.2–0.3 mm wide, convoluted, when dry forming tube. Disk florets bisexual, tubular, cylindrical, narrowed below into narrower cylindrical tube, five-toothed (teeth blue), 3.5–4.1 mm long, tube sparsely pubescent in middle with appressed hairs. Pappus two-rowed, outer bristles very short, inner 3.5–4.5 mm long; achenes oblongly lanceolate, somewhat flat, 2–3 mm long, covered with somewhat stiff, semi-appressed hairs. Flowering VII–IX.

232 Mountains, alpine grassy meadows and rubble slopes, among stones, at 3,000–4,800 m. —*Soviet Central Asia*: Pamiro-Alai, Tien Shan (Chimgan)? *General distribution*: Iran Region (Afghanistan), Dzhungaria-Kashgaria (Kashgaria)? Described from Afghanistan. Type in Vienna and Beltsville (USA).

28. **E. eriocephalus** J. Vahl. in Hornem. Icon. Fl. Dan. XIII, fasc. XXXIX (1840) 6. —*E. arcticus* Rouy Fl. Fr. VIII (1903) 160, p. p. quoad pl. e Novaja Semlja. —*E. uniflorus* L. ssp. *eriocephalus* Cronq. in Brittonia 6, 2 (1947) 234. —**Ic.**: Horneman, op. cit. tab. 2299.

Perennial. Rhizome short, branched. Stems one to six, herbaceous, erect, green or reddish, 3–25 cm high and 1.0–1.5 mm thick, leafy, single-headed, not densely pubescent with long, erect, colorless, multicellular hairs (very rarely in upper part of stem hairs with dark-colored septa), mixed with stalked, capitate glands (sometimes also with dark-colored septa) or simple, short, fastigiate hairs. Leaves green, entire; basal leaves 1–10 cm long and 3.0–7.5 mm wide, oblanceolate, obtuse, long-petiolate, ciliately pubescent with long, soft, colorless, multicellular hairs, sparsely pubescent on both sides with similar hairs or glabrous; cauline leaves three to nine, 0.5–5.0 cm long and 1–7 mm wide, lower leaves like basal, upper linearly lanceolate, cuspidate, sessile, more or less densely pubescent with long, colorless, multicellular hairs. Capitula 9–15 mm long and 1.5–2.8 cm wide. Involucral bracts longer than disk, many-rowed, reddish, very rarely green, linearly lanceolate, long-acuminate, lax; outer bracts usually recurved, densely covered with fine, long, multicellular, erect hairs usually with dark-colored septa, less often colored septa only in hairs at tip of involucral bracts, but sometimes all hairs colorless; inner bracts 5–8 mm long and 0.7–1.0 mm wide, outer usually somewhat shorter. Ray florets pistillate, 5.0–7.5 mm long, of which tube about 3 mm, sparsely covered above with short and erect hairs; ligules lilac or violet, 0.2–0.3 mm long, with two obtuse teeth at tip, convoluted when dry forming tube. Disk florets bisexual, tubular, cylindrical, narrowed below into narrower cylindrical tube, five-toothed (teeth of same color as ligules), 2.5–3.5 mm long, sparsely covered above with short, erect hairs. Pappus two-rowed, outer bristles very short, inner 3.0–4.5 mm long; achenes developing in all florets, almost linear, flat, about 2 mm long and 0.4 mm wide, covered with semi-appressed, somewhat stiff, not very long hairs. Flowering VII–IX.

233 Tundra, along dry slopes, steep, sandy riverbanks; in mountains — on rocks, stony slopes and in alpine grassy meadows. —*Arctic*: Novaya Zemlya, Arctic Siberia; *Western Siberia*: Ob Region (north); *Eastern Siberia*: Yenisei (north), Lena-Kolyma (northern). *General distribution*: The Arctic, Beringia, North America. Described from Greenland. Type in Copenhagen.

29. **E. humilis** Grah. in Edinb. N. Phil. Journ. (1828) 175; Cronquist in Brittonia 6, No. 2, 237; Hultén, Fl. Alaska a. Yukon X, 1503. —*E. pulchellus* DC. β *unalaschkense* DC. Prodr. V (1836) 287; Ldb. Fl. Ross. II, 486. —*E. arcticus* Rouy, Fl. Fr. VIII (1903) 160, p. p. quoad pl. Spitzbergensem. —*E. unalaschkensis* Vierh. in Beih. Bot. Centralbl. XIX, 2 (1906) 492; Kom. Fl. p-ova Kamch. III, 126; Hultén, Fl. Kamtch. III, 161.—*E. melanocephalus* Gombocz. in Bot. Közl. 37 (1940) 12.

Perennial. Rhizome short, branched. Stems one to eight, herbaceous, erect, green or reddish, 1.5–26.0 cm high and 0.5–1.5 mm thick, leafy, single-headed, sparsely pubescent with long, squarrose, multicellular hairs with dark-colored septa, and with short, appressed hairs and short-stalked, capitate glands. Leaves entire, covered with long, squarrose, multicellular hairs with dark- or light-colored septa; basal leaves oblanceolate, acute or obtuse, long-petiolate, 1–10 cm long and 2–11 mm wide; cauline laeves three to nine, lanceolate, acute, 0.5–6.0 cm long and 0.5–0.7 mm wide. Capitulum 7–12 mm long and 1.0–2.3 cm wide; involucral bracts 6–10 mm long and about 0.75 mm wide, longer than disk, dark red, almost black, linearly lanceolate, long acuminate, compactly appressed, not recurved, densely pubescent with long, fine, intertwined, multicellular hairs with dark-colored septa. Ray florets pistillate, 5.0–7.5 mm long (of which tube 2.0–2.5 mm, with occasional short hairs); ligules lilac, about 0.25 mm wide, convoluted when dry, forming tube. Disk florets bisexual, tubular, cylindrical, narrowed below into narrower, cylindrical tube, five-toothed (teeth of same color as ligules), 3.0–3.8 mm long, tube with occasional short, squarrose hairs above. Pappus two-rowed, outer bristles very short, inner 3–4 mm long; achenes developing in all florets, lanceolate, flat, 2.2–2.5 mm long and about 0.5 mm wide, sparsely pubescent with semi-appressed hairs. Flowering VII–IX. (Plate XIV, Fig. 2).

Tundra along banks of rivers and streams, in mountains on stony slopes. —*Arctic:* Chukotka, Anadyr; *Far East*: Kamchatka. *General distribution*: Arctic (Greenland, Spitzbergen), Iceland, Scandinavia, Beringia, North America. Type in Edinburgh grown from seeds obtained from the Canadian Arctic.

234 *Series* 3. Lonchophyllae Botsch. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVIII (1957) 263. —Inflorescence racemose; terminal capitulum larger than others, or stems one-headed. Involucre three-rowed; inner bracts longer than disk; outer bracts considerably shorter, often half as long as inner. Disk florets narrow-conical, pubescent only in upper part. Leaves narrow, long, ciliately pubescent with multicellular, somewhat stiff, rather long hairs or glabrous, but on both sides always glabrous or subglabrous. Biennials or short-lived perennials with slender fibrous roots.

30. **E. lonchophyllus** Hook. Fl. Bor. Amer. II (1834) 18; Botschantzev in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVIII, 261. —*E. armerifolius* Turcz. ex DC. Prodr. V (1836) 291; ej. Fl. baic.-dah. II, 1, 25; Krylov, Fl. Zap. Sib. XI, 2683. —*E. podolicus* Besser β. *pusillus* Ldb. Fl. alt. IV (1833) 90. —*E. armeriaefolius* Turcz. α. *humilis* Ldb. Fl. Ross. II (1845–1846) 489. —*E. armeriaefolius* Turcz. β. *elatior* Ldb. ibid. —*Trimorpha armerifolia* Vierh. in Beih. Bot. Centralbl. XIX, 2 (1906) 424. —*Erigeron acer* L. var. *armeriaefolius* O. and B. Fedtsch. Perech. Rast. Turk. IV (1911) 166. —*E. ledebourianus* Novopokr. in Spisok. Gerb. Fl. SSSR, XI (1949) 26, nom. Provis. —**Exs.**: Gerb. Fl. SSSR, Nos. 3251 and 3252 (sub *E. armeriifolius* Turcz.).

Biennial or short-lived perennial. Root weak fibrous. Stems 3–30 cm high, leafy, erect or ascending, usually many in one mat of simple, single-headed or more often branched (with one to eight single-headed branches forming racemose, very rarely paniculate inflorescence), sparsely covered with squarrose, long, multicellular hairs mixed particularly below capitula, with scattered or dense, short, appressed, sometimes squarrose hairs. Leaves entire, ciliately pubescent with long hairs as on stem and moreover, particularly upper leaves, sometimes pubescent also on both sides; basal leaves and those of sterile rosette petiolate, linearly lanceolate or lobed, 1–10 cm long and 1.5–8.0 mm wide; cauline leaves linearly lanceolate or linear, acute, lower leaves petiolate, upper sessile, 0.5–9.5 cm long and 0.5–3.0 mm wide. Terminal capitula largest, developing earlier than others in inflorescence, 0.8–1.0 cm long and 1.5–2.0 cm wide. Involucre three-rowed, imbricate; inner bracts linearly lanceolate, long acuminate, yellowish-green, apically dark violet, dorsally covered sparsely with long, erect, multicellular hairs, longer than pappus by their apex, sometimes almost as long as pappus, 0.5–0.75 mm wide and 5.5–8.5 mm long; outer bracts all similar, but almost half as long. Ray florets pistillate, four-whorled, 5–7 mm long, tube with occasional, short, appressed hairs above; ligules 2.0–3.5 mm
235 long, with two teeth at tip, lilac, violet or almost white, convolute, forming a tube. Disk florets 4.0–4.5 mm long, bisexual, tubular, five-

toothed, pale-yellow, sparsely pubescent in middle or above on tube with appressed hairs, lobes glabrous, often violet. Achenes developing in all florets, lanceolate, flat, 1.5–2.0 mm long and about 0.3 mm wide, sparsely pubescent with nonconnivent, appressed hairs; pappus 4.5–5.0 mm long, two-rowed, pappus bristles slender, finely barbed, some outer bristles very short. Flowering VII–IX. (Plate XIV, Fig. 3).

Meadows along banks of rivers, lakes and swamps, foothill plains and mountains along river valleys. —*Western Siberia*: Irtysh, Altai; *Eastern Siberia*: Yenisei, Lena-Kolyma, Angara-Sayans, Dauria; *Soviet Central Asia*: Balkhash Region, Tien Shan. *General distribution*: Dzhungaria-Kashgaria, Mongolia, Beringia; North America. Described from North America. Type in Edinburgh.

31. **E. popovii** Botsch. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVIII (1957) 263. —*E. glaberrimus* M. Pop. in Tr. Uzbek. Gos. Univ. Nov. Ser. 27, Biol., No. 14 (1941) 70, nom. seminud., non Scheele ex Nym. (1878–1882). —**Ic.**: Popov, op. cit. Fig. 2.

Biennials or short-lived perennials. Roots weak, fibrous. Stems glabrous, leafy, 1.5–17.5 cm high and upto 1.5 mm thick, solitary and erect or often many, ascending, sometimes single-headed, but usually in racemose inflorescence of two to seven capitula on single-headed shoots. Leaves entire, glabrous or very rarely with occasional short hairs along margin; basal leaves petiolate, oblanceolate, lanceolate, or linearly lanceolate, acuminate, 0.6–5.0 cm long and 1.5–4.0 mm wide; cauline leaves 0.4–6.0 cm long and 0.3–2.0 mm wide, linearly lanceolate or linear, acuminate; lower leaves short-petiolate, upper sessile. Terminal capitula largest in inflorescence, 7–9 mm long and 11–16 mm wide. Involucre imbricate; bracts glabrous or very rarely with occasional short bristles on dorsal side, linear, long acuminate, apically violet; outer bracts about 0.5 mm wide and 3.7 mm long, inner longer than disk, about 0.6 mm wide and almost two times as long as outer, about 7 mm long. Ray florets pistillate, about 5.5 mm long, tube with occasional squarrose, short hairs above; ligules lilac, linear, two-toothed, convolute, forming tube, about 2.7 mm long. Disk florets not colored, tubular, five-toothed, about 4 mm long, with occasional, short, appressed hairs in upper part of tube. Achenes developing in all florets, flat, about 1.7 mm long and 0.3 mm wide, linearly lanceolate, sparsely pubescent with appressed, nonconnivent hairs; pappus with 25, fine, barbed bristles, about 4 mm long; bristles of outer series few, very short. Flowering VI–VIII.

236 Meadows, along rivers and streams, in mountains, at 2,000–2,600 m. —*Soviet Central Asia*: Pamiro-Alai (Gissar, Zeravshan and Turkestan ranges). Described from the upper reaches of the Zeravshan River. Type in Leningrad.

32. **E. oreades** (Schrenk) Fisch. and Mey. in Suppl. ad Ind. Sem. Hort. Petropol. XI (1846) 17; Vierh. in Beih. Bot. Centralbl. XIX, 2, 552; O. and B. Fedtsch. Perech. Rast. Turk. 4, 165; Popov in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, 7, 9, p. p. quoad nomen; Botschantzev in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVIII, 265. —*E. uniflorus* β. *oreades* Schrenk, Enum. pl. nov. II (1842) 39; Ldb. Fl. Ross. II, 490. —*E. alpinus* L. var. *oreades* Trautv. in Bull. Soc. Nat. Mosc. XXXIX, 2 (1866) 340.

Biennial or short-lived perennial. Root weak, fibrous. Stems densely pubescent throughout with squarrose, rather long, but in upper part with, short, appressed hairs also, leafy, 2.5–25.0 cm high and up to 2.5 mm thick, solitary, erect, or many, basally ascending, usually simple, single-headed, but sometimes with two to eight capitula in racemose inflorescence on simple, single-headed shoots. Leaves entire, ciliately pubescent along margin and petiole with rather long hairs; basal leaves petiolate, obovate, obtuse or oblanceolate and acuminate, 0.5–7.0 cm long and 2.7 mm wide; cauline leaves 0.4–8.0 cm long, 0.5–4.5 mm wide, linearly lanceolate, acute; lower leaves petiolate, upper sessile. Capitulum 0.8–1.0 cm long and 1.5–2.0 cm wide. Involucre three-rowed, imbricate; bracts linearly lanceolate, long acuminate, herbaceous, dorsally violet, sparsely covered with rather long, erect hairs; inner bracts about 1 mm wide and 7–9 mm long, outer almost half as long as inner. Ray florets pistillate, violet or lilac about 6.5 mm long, tube with less numerous, rather long, erect hairs above; ligule convolute. Disk florets about 4.5 mm long, bisexual, tubular, five-toothed (teeth glabrous, violet), tube sparsely pubescent with appressed hairs in middle. Achenes developing in all florets, linearly lanceolate, flat, about 2.2 mm long and 0.6 mm wide, densely covered with long and erect, appressed hairs; pappus with 25, very thin, barbed bristles, about 4.5–5.0 mm long; bristles of outer row less numerous and very short. Flowering VII–IX.

Alpine and subalpine meadows. —*Western Siberia*: Altai; *Eastern Siberia*: Angara-Sayans; *Soviet Central Asia*: Dzhungaria-Tarbagatai, Pamiro-Alai, Tien Shan. *General distribution*: Dzhungaria-Kashgaria, Mongolia. Described from specimens in the Petersburg Botanical Garden grown from seeds collected from Tarbagatai. Type in Leningrad.

Series 4. Trimorphopsis Botsch. Capitula more or less equal, solitary or aggregated in inflorescence. Inner involucral bracts shorter than
237 disk, but outer bracts almost half as long as inner ones; disk florets narrow-conical and pubescent throughout or cylindrical, narrowed below, and pubescent above. Plants with developed caudex or with rhizome.

33. **E. pseuderiocephalus** M. Pop. in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, No. 7 (1948) 10; Botschantzev in Bot. Zhurn. 42, No. 5, 773. —*E. discernendus* Rech. f. in Dan. Biol. Ser. (Symb. Afghanicae II) 8, No. 2 (1955) 6, fig. 1 and 8a.

Perennial with cord-like root; caudex branched. Stems many, 10–45 cm high and 1–3 mm thick, branched, straight, flexuous above, leafy, green or reddish, usually sparsely covered (very rarely dense) with stiff, long, squarrose, multicellular hairs mixed with short, appressed hairs, sometimes in upper part of stem hairs mixed with short-stalked, capitate glands, less often only with short, appressed hairs and sometimes entirely glabrous below. Leaves entire, green, somewhat coriaceous, ciliate along margin, but sometimes with long, somewhat stiff, squarrose, multicellular hairs on both sides; basal leaves oblanceolate, obtuse or acute, long-petiolate, 15–10 cm [sic..] long and 3–12 mm wide; lower cauline leaves like basal; middle and upper cauline leaves lanceolate or linearly lanceolate, acute, 0.2–6.5 long and 0.5–7.0 mm wide. Capitula many, 1.7–2.5 cm wide and 0.8–1.2 cm long. Involucral bracts linearly lanceolate, acute, with sparse or dense, stiff, long, squarrose, multicellular hairs, sometimes mixed with short-stalked, capitate glands; inner bracts 7.0–8.5 mm long and 0.7–1.3 mm wide, outer almost half as long. Ray florets pistillate, 7.5–10.0 mm long (tube about 6 mm long), with less numerous long, appressed hairs in upper part of tube and lower part of ligule; ligules pink or violet, about 0.4 mm wide. Disk florets 6.0–7.5 mm long, bisexual, tubular, narrow-conical, five-toothed, with tube sparsely pubescent throughout; lobes of same color as ligules. Pappus 6.0–7.5 mm long; achenes oblongly lanceolate, compressed, about 3 mm long and 0.8 mm wide, with somewhat stiff, semi-appressed hairs. Flowering VI–IX. (Plate XIV, Fig. 4).

Mountains, on stony slopes, rocks, moraines, riverine gravel-beds, at 2,100–3,700 m. —*Soviet Central Asia*: Pamiro-Alai. *General distribution*: Iran region (Afghanistan). Described from the Zeravshan glacier. Type in Tashkent.

Note. In the brief description of *E. pseuderiocephalus* M. Pop. the type was not mentioned. Of the few specimens of the species annotated 238 by the author, I select the following as the type: Zeravshan valley; near the Zeravshan glacier; gravel-bed, 18.VII.1927, No. 249, V. Drobov. The type is preserved in the herbarium of Soviet Central Asian State University, Tashkent.

Apart from the recognized formal character distinguishing subgenus *Trimorpha* (ligulate and tubular pistillate florets in the same capitulum) from subgenus *Euerigeron* (only ligulate florets are pistillate), *E. schmalhausenii* M. Pop. is not at all different from *E. pseuderiocephalus* M. Pop. *E. pseuderiocephalus* M. Pop. (subgenus *Euerigeron)* is geographically separated from *E. schmalhausenii* M. Pop. (subgenus *Trimorpha*). Their ranges, contiguous in the Alai Range and Pamir, extend, in the first case, from there to the southwest through the Pamiro-Alai to Afghanistan and, in the second case, to the northeast through the Tien Shan up to the Altai. It might seem that it would have been more correct to consider *E. pseuderiocephalus* M. Pop. as a separate race of *E. schmalhausenii* M. Pop., in which all pistillate florets are ligulate. However, this does not exhaust the peculiarities of its form. Thus, near Lake Iskander-Kul (in the upper Zeravshan) V.L. Komarov, in 1892, collected *Erigeron* similar to *E. pseuderiocephalus* M. Pop. in all aspects, but completely lacking pistillate florets (only with bisexual florets).

34. **E. trimorphopsis** Botsch. in Addenda XXIV, 584.

Perennial. Rhizome short, branched; stems many, 12–35 cm high and 1–2 mm thick, erect, leafy, green, simple and single-headed or branched with two or three capitula on long branches, covered with stiff more or less long squarrose, multicellular and very short, appressed hairs, but sometimes below capitula also with short-stalked, capitate glands. Leaves green, entire, ciliate along margin, but sometimes with stiff, squarrose, more or less long, multicellular hairs on both sides; basal leaves oblanceolate, obtuse or acute, long-petiolate, 2.5–12.0 cm long and 4–13 mm wide; cauline leaves 0.5–9.0 cm long and 1–10 mm wide, lower leaves like basal, upper lanceolate, acute, sessile. Capitulum 0.9–1.3 cm long and 1.5–2.5 cm wide. Involucral bracts shorter than disk, green, linearly lanceolate, acuminate; inner bracts 5–7 mm long and 0.7–1.0 mm wide; outer almost half as long. Ray florets pistillate, 5.2–8.2 mm long (of which tube 2.4–3.1 mm), sparsely pubescent in upper part of tube with appressed hairs; ligule pink, about 0.5 mm wide, convolute, forming tube. Disk florets 4.0–4.5 mm long, bisexual, tubular, cylindrical, abruptly narrowed below into narrower cylindrical tube, five-toothed, with pink lobes, sparsely pubescent in upper half with appressed hairs. Pappus two-rowed, outer bristles very
239 short, inner 3.9–5.5 mm long; achenes oblongly lanceolate, compressed, 2.5–2.7 mm long, with somewhat stiff, semi-appressed hairs. Flowering VII–VIII.

Mountains, in subalpine meadows at 2,700–2,800 m. —*Soviet Central Asia*: Pamiro-Alai, Tien Shan. Endemic. Described from the Gissar Range. Type in Leningrad.

Section 3. CAENOTUS Nutt. Gen. Amer. II (1818) 148. —*Conyza* Less. Syn. Gen. Comp. (1832) 203. —Capitula small, in somewhat dense paniculate inflorescence. Ligulate florets pistillate, many-rowed;

ligules white, after sometimes turning pale violet after flowering, very short, not recurved two-toothed. Bisexual disk florets less numerous, with glabrous lobes. Achenes developing in all florets. Pappus identical in all achenes, one-rowed, long. Annuals, pubescent mainly with somewhat stiff, appressed hairs.

Note. Conyza Less., which corresponds to the section *Caenotus* Nutt. being reviewed here, was among the generic names included in the "Nomina generica conservanda" by the VIII International Botanical Congress in 1954. But it is not identical to the genus *Conyza* L. in interpretation and content. Separation of section *Caenotus* Nutt. from the genus *Erigeron* L. as an independent genus is not convincing. Also, there is no need for doing so. In fact, any typical character of the so-called genus *Conyza* Less. that we considered was found to be typical either of some species which are phylogenetically quite distant from the Mediterranean subgenus *Conyzastrum* (Boiss.) M. Pop. of the genus *Erigeron* L., or of American representatives of the subgenus *Euerigeron* (Boiss.) M. Pop., closely related to the genus *Conyza* Less. If the genus *Conyza* Less. (in the new circumscription) were recognized, the superficial resemblance of some species of the subgenus *Conyzastrum* (Boiss.) M. Pop. could lead to the purely artificial inclusion of these species in the latter, which would upset the naturalness of both the subgenus *Conyzastrum* (Boiss.) M. Pop. and the genus *Conyza* Less., as had happened due to disturbance of the natural habit of the American representatives of the subgenus *Euerigeron*[†] (Boiss.) M. Pop. after inclusion of *Conyza* Less. in nomina conservanda.

35. **E. canadensis** L. Sp. pl. (1753) 863; Ldb. Fl. Ross. II, 487; Boiss. Fl. Or. III, 163; O. and B. Fedtsch. Perech. Rast. Turk. IV, 165; Grossh. Fl. Kavk., Izd. 1, IV, 97; Popov in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, 7, 10; Krylov, Fl. Zap. Sib. XI, 2684; Majevski, Fl., Izd. 8, 567, Fig. 210; Botschantzev in Bot. Zhurn. XLII, No. 5, 773. —*E. paniculatum* Gilib. Fl. lithuan. III (1781) 215. —*Caenotus canadensis* Raf. Fl. Tellur II (1836) 50. —*Conyzella canadensis* Rupr. Fl. ingrica (1853) 559. —*Leptilon canadensis* Britton in Britton and Brown Ill. Fl. North U.S. III (1898) 391. —*Conyza canadensis* Cronquist in Bull. Torr. Bot. Club, LXX, 6 (1943) 632. —*E. myriocephalus* Rech. f. and Edelberg in Dan. Biol. Ser. 8, No. 2 (Symbolae Afghanicae II) (1955) 6, fig. 2, non Herter (1939). —**Ic.**: Hegi, Ill. Fl. VI, 1, t. 260, fig. 1; Syreistsch. Ill. Fl. III, 244. —**Exs.**: GRF No. 1026.

240 Annual. Stem 3–150 (200) cm high, erect, usually branched only above in inflorescence, densely leafy, sparsely covered with stiff, simple,

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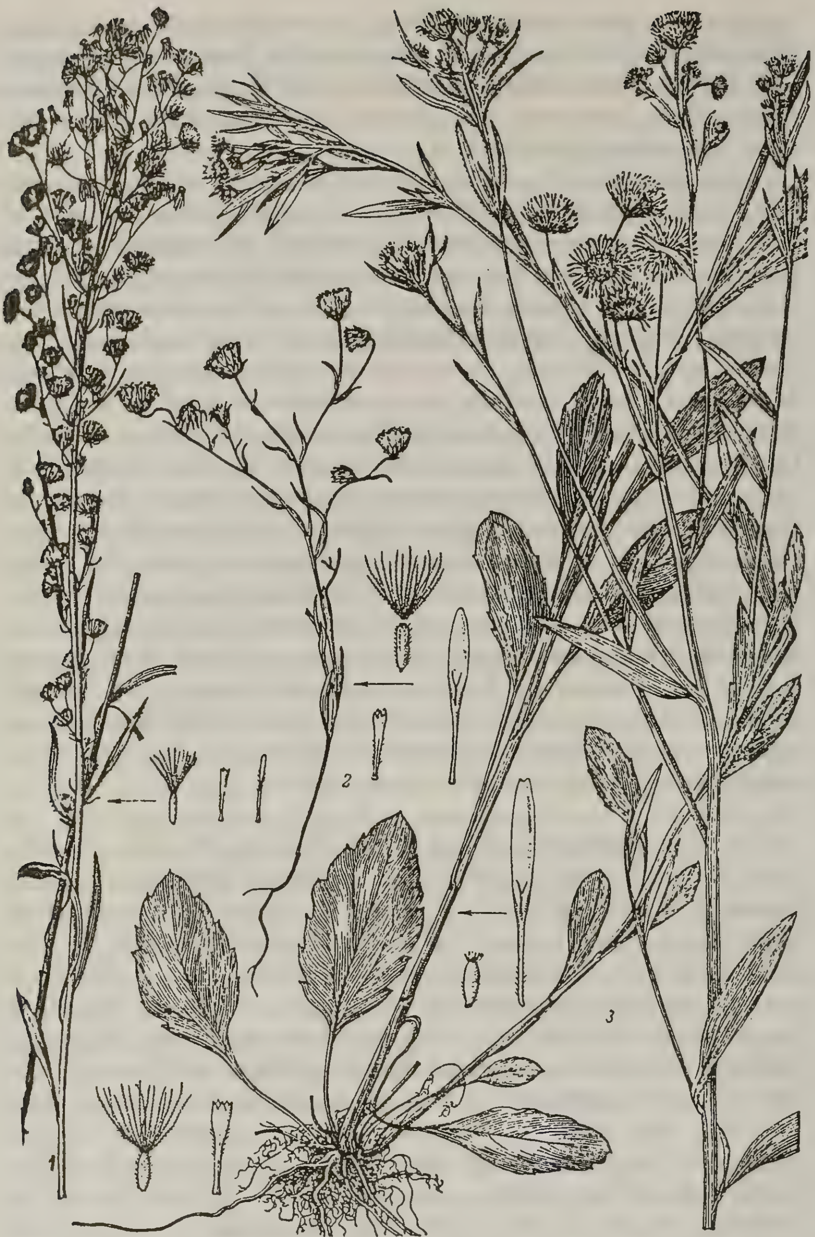
[†] Misspelled "*Eurigeron*" in Russian text. —Sci. Ed.



241 Plate XV.

1—*Erigeron canadensis* L., habit; bisexual floret; ligulate floret; 2—*Chamaegeron obligocephalus* Schrenk, habit; achene with deciduous pappus; bisexual floret, ligulate floret; 3—*Erigeron annuus* (L.) Pers., habit, bisexual floret and its achene (at the bottom from left), ligulate floret and its achene (at right).

spreading or upcurved hairs, long below but gradually reduced above. Leaves green, erect, linearly lanceolate, long acuminate, 0.1–11.0 cm long and 0.2–18.0 mm wide; lower leaves petiolate, usually remotely finely serrate-toothed, sparsely covered along margin and on both surfaces with long, stiff, upcurved hairs; leaves gradually reduced and without teeth toward stem apex, but hairs shorter and only along leaf margin; upper leaves sessile. Inflorescence somewhat narrow paniculate. Capitula most numerous, 4.5–5.0 mm long and about 8 mm wide. Inner involucral bracts about 3.5 mm long and 0.3 mm wide, linear, acute, glabrous, herbaceous, membranous along margin and at apex very shortly and finely toothed-fimbriate; outer bracts half as long, herbaceous, dorsally with occasional short, stiff, upcurved, simple hairs. Receptacle indistinctly tuberculate, without septa, with more or less identical areola of achene attachment. Ray florets pistillate, many-whorled, 2.5–3.5 mm long, with scattered short hairs in upper part of tube; ligules erect, yellow, pale violet after flowering, 0.5–1.0 mm long, linear, with two very tiny obtuse teeth at apex. Disk florets pale yellow, bisexual, tubular, 2.5–3.0 mm long, cylindrical, four-toothed (very rarely three-toothed), sparsely pubescent in upper part of tube. Pappus 2.5–3.0 mm long, of 20–22 equal bristles, one-rowed; achenes 1.25–1.5 mm long, linearly lanceolate, compressed, sparsely pubescent with short, appressed hairs, developing in all florets. Flowering V–VI. (Plate XV, Fig. 1).

As weed, around living quarters, in crops and low-lying areas, meadows, forests, along rivers, lakes, irrigation systems, and roadsides. —*European Part*: All regions; *Caucasus*: All regions; *Western Siberia*: Ob' River area (south), Upper Tobol, Irtysh, Altai; *Eastern Siberia*: Angara-Sayans; *Far East*: Ussuri, Sakhalin, Kuril Islands; *Soviet Central Asia*: All regions. Introduced plant. Described from North America. Type in London.

36. **E. bonariensis** L. Sp. pl. (1753) 863; Grossh. Opredel. Rast. Kavk. 442. —*Dimorphanthes floribunda* Cass. in Dict. Sc. Nat. XXV (1822) 96. —*Leptilon bonariense* Small Fl. Southeast U.S. (1903) 1231. 243 —*Conyza bonariensis* Cronquist in Bull. Torr. Bot. Club. LXX, 6 (1943) 632. —**Ic.**: Bellfreund. Fl. Argent. II, t. 69.

Annual. Stem 100–200 cm high, erect, usually branching only above in inflorescence, densely leafy, more or less densely covered with somewhat stiff, simple hairs, some hairs long and erect but majority short, upcurved. Leaves green, spreading upward, linearly lanceolate, long acuminate, ciliately pubescent and both sides with hairs like stem, 0.15–12.0 cm long and 0.2–18.0 mm wide, gradually reduced from base to apex; lower leaves petiolate, coarsely serrate-toothed, upper sessile, entire. Inflorescence usually broad paniculate. Capitula numerous, about 6 mm long and 11 mm wide. Inner involucral bracts about 4.5 mm long and 0.7 mm wide, linear, acute, dorsally sparsely covered with somewhat stiff, simple, appressed hairs, herbaceous, membranous along margin, finely ciliate at apex, fimbriate; outer bracts less than half as long as inner, not membranous along margin, more densely pubescent. Receptacle alveolate with distinct septae between alveolae, central alveolae larger than peripheral. Ray florets pistillate, many-rowed, about 4 mm long, sparsely pubescent in upper part of tube; ligules erect, white, pale violet after flowering, about 0.3 mm long and 0.2 mm wide, linear, with two slender, acute teeth at apex. Disk florets pale yellow, bisexual, tubular, five-toothed, pubescent in upper part of tube with scattered short hairs; above slightly conically enlarged at lobes. Pappus about 4 mm long, of 20 equal bristles, one-rowed; achenes 1.25 mm long, broad, lanceolate, sparsely pubescent with thin, semi-appressed hairs, compressed, developing in all florets. Flowering VII–XI.

In weedy places, along roadside and trenches, in tea gardens. —*Caucasus*: Western Transcaucasia. Exotic. Described from South America. Type in London.

Section 4. PHALACROLOMA (Cass.) Torrey and Gray, Fl. N. Am. 2 (1841) 176. —Capitula not large in lax panicle. Ligulate florets two-whorled; ligules recurved, flat, white or bluish. Disk florets numerous with glabrous teeth. Achenes of ligulate florets with one-rowed, very short crown, connate into ring and fimbriate-scaly in upper part; achenes of disk florets with one-rowed pappus of very short scales and 10–15 long fine, fragile, weakly scabrous bristles. Annual or biennial, covered with stiff, short, upcurved hairs, sometimes mixed with long erect hairs.

244 *Note*. In the Soviet Union, species of section *Phalacroloma* (Cass.) Torr. and Gray, introduced from America, are usually considered as a separate genus —*Stenactis* Cass. However, most authors working on the American flora for a long time and until recently (for example, Hooker, *Fl. Bor. Amer.* II, 1840, 20, or Cronquist in *Brittonia* VI, 2, 1947, 140) confirm that the species of this section are so closely related to many American species of the genus *Erigeron* L. that there is no need to discuss separating them into their own genus. And in fact, it is enough to be familiar with the species of the section *Oligotrichium* Nutt., with the structure of their pappus, for example, in *Erigeron divergens* Torr. and Gray, to be convinced about it. In *Erigeron divergens* Torr. and Gray the reduction of pappus bristles has gone so far that it is absolutely baseless to isolate *Stenactis* Cass. as a separate genus only because long bristles are lacking in the pappus of its ligulate florets, but in *Erigeron divergens* Torr. and Gray some of these bristles are still found.

Thus, the efforts of our authors to separate *Stenactis* Cass. from the genus *Erigeron* L. may be explained only by their lack of knowledge about the characteristic features of the American species of the genus *Erigeron* L.

37. **E. annuus** (L.) Pers. Syn. Pl. 2 (1807) 43; Cronquist in Brittonia VI, 2, 265. —*Aster annuus* L. Sp. pl. (1753) 875. —*Erigeron heterophyllus* Mühl. ex Willd. Sp. pl. III, 3 (1804) 1956. —*Diplopappus dubius* Cass. in Bull. philom (1817) 137 and (1818) 77. —*Stenactis annua* Cass. in Dict. sc. nat. 37 (1825) 485. —*Phalacroloma acutifolium* Cass. in Dict. sc. nat. 39 (1826) 405. —*Stenactis annua* Ness. Gen. et sp. Ast. (1833) 273; Ldb. Fl. Ross. II, 491; Grossh. Fl. Kavk. Izd. 1, IV, 96; Majevski, Fl. Izd. 8, 567.—**Exs.**: GRF No. 23.

Annual, sometimes biennial. Stem erect, 35–100 cm high, branched above, pubescent below with rather long, scattered, spreading, simple, stiff hairs; upwards, with shorter and denser, upcurved, simple, stiff hairs. Basal leaves elliptical or ovate, coarsely serrate-toothed, long-petiolate, usually withering before flowering, 6–17 cm long and 1.5–4.0 cm wide; lower cauline leaves similar but short-petiolate, together with basal leaves pubescent with hairs like lower part of stem; upper leaves smaller, oblongly lanceolate, acute, entire, sessile, 0.3–6.0 cm long and 0.5–15.0 mm wide, pubescent with hairs like upper part of stem. Capitulum about 0.6–0.8 cm long and 1.5–1.7 cm wide, in lax panicle. Involucral bracts herbaceous, lanceolate, acute, many-rowed, about 3 mm long and 0.5–1.0 mm wide, dorsally with few, long, erect, multicellular hairs. Ray florets pistillate, two-whorled; tube about 1 mm long, sparsely pubescent in upper part with rather long, appressed hairs;
245 ligules flat, recurved, white, sometimes bluish, about 5 mm long and 0.6 mm wide, linear, two-toothed; style branches linear. Disk florets bisexual, numerous, yellow, obconical-tubular, five-toothed, about 2 mm long, sparsely appressed-hairy in middle of tube; style branches short, linear, obtuse. Achenes developing in all florets, lanceolate, compressed, about 1.2 mm long, sparsely covered with soft appressed hairs; achenes of ligulate florets with very short, one-rowed crown connate with fimbriate, membranous upper part; achenes of tubular florets with one-rowed pappus of short scales and 10–15 long (up to 2 mm), thin, fragile, weakly scabrous bristles. Flowering VI–IX. (Plate XV, Fig. 3).

In weedy places and wastelands, gardens and forests. —*European Part*: Karelia-Lapland, Baltic, Upper Dnieper, Upper Volga, Upper Dniester, Middle Dnieper, Volga-Don, Bessarabia, Black Sea Region; *Caucasus:* Ciscaucasia, western Transcaucasia. An introduced plant. Described from Canada. Type in London.

38. **E. strigosus** Mühl. ex Willd. Sp. pl. III, 3 (1804) 1956; Cronquist in Brittonia VI, 2, 266. —*Doronicum ramosum* Walt. Fl. Carol. (1788) 205. —*Stenactis strigosa* DC. Prodr. V (1836) 299. —*Phalacroloma beyrichtii* Fisch. and Mey. in Ind. sem. Horti. Bot. Petropol. 6 (1840) 63.— *Erigeron ramosus* Britt., Sterns. and Pogg. Prelim. Cat. N.Y. Pl. (1888) 27, non Raf. —*E. pseudoannuus* Makino in Journ. Bot. VI (1929) 5. —*Stenactis ramosa* Domin in Preslia 13–15 (1935) 226. —*S. pseudoannuus* Worosch. in Spisok Semyan Gl. Bot. Sada, Akad. Nauk SSSR 9 (1954) 65. —*S. ramosa* Walter ex Rasiniš Latv. PSR nez. aug. Sekl. (1954) 112. —*Erigeron annuus* auct., non Pers.: Komar. and Alis. Opredel. Rast. Dalnevost. Kr. II (1932) 1017. —**Ic.**: Komar. and Alis. ibid, Plate 304; Terasaki, Icon. fl. Jap. (1933) 621 (sub *E. pseudo-annuus* Makino).

Annual or very rarely biennial. Stem erect, 30–75 cm high, branched above, covered throughout as well as on branches and leaves with upwardly strigose, short, stiff hairs. Basal leaves obovate, obtuse, sparsely and finely serrate-toothed, long-petiolate, usually withering before flowering, 3.5–8.0 cm long and 0.7–1.5 cm wide; lower cauline leaves like basal, all others short-petiolate or sessile, lanceolate, acute, entire, 0.2–6.5 cm long and 0.3–8.0 mm wide. Capitulum 14–16 mm wide and about 8 mm long, in lax panicle. Involucral bracts herbaceous, lanceolate, acute, many-rowed, about 3 mm long and 0.5 mm wide, dorsally with less numerous appressed, stiff, multicellular hairs. Ray florets pistillate, two-whorled, about 0.6 mm wide and 5 mm long, of which tube about 1 mm, with somewhat long hairs in upper part of tube; ligules white, flat, with two obtuse teeth at apex. Disk florets numerous, bisexual, yellow, obconical-tubular, five-toothed, about 1.8 mm long, 246 sparsely pubescent in middle part of tube with appressed hairs. Achenes developing in all florets, lanceolate, compressed, about 1 mm long and 0.3 mm wide, sparsely appressed hairy; achenes of ligulate florets with very short, one-rowed crown connate into ring, but fimbriate-membranous in upper part; achenes of disk florets with one-rowed pappus of short scales and 10–15 long (up to 2 mm), fine, fragile, weakly scabrous bristles. Flowering VI–IX.

A weed of wastelands and meadows. —*European Part*: Baltic, Ladoga-Ilmen; *Far East*: Ussuri. Exotic. Described from the USA. Type preserved in Berlin.

Subgenus II. **TRIMORPHA** (Cass.) M. Pop. in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, No. 7 (1948) 10.

Florets multicolored, of three types: peripheral florets pistillate, ligules blue, violet, lilac or pink, in the dried state convolute into tube; middle pistillate florets tubular, ligules colorless or slightly colored with same color as peripheral florets; disk florets tubular, narrow-conical, yellowish with glabrous lobes; color of florets not changing after flowering. Achenes one-fourth to half as long as pappus, developing in all florets of capitulum. Involucre shorter than or as long as disk, very rarely longer than disk.

Perennial herbs or biennials with toothed or entire leaves.

Section 1. BRACHYGLOSSAE Vierh. in Beih. Bot. Centralbl. XIX, 2 (1906) 423.

Ligules as long as disk or somewhat longer; pappus three to four times as long as achenes; involucre shorter than disk. Biennials or perennials.

39. **E. acer** L. Sp. pl. (1753) 863; Ldb. Fl. Ross. II, 488, p. p.; Boiss. Fl. or. III, 166, p. p.; O. and B. Fedtsch. Perech. Rast. Turk. IV, 165; Grossh. Fl. Kavk. Izd. 1, IV, 97; Popov in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, No. 7, 11; Krylov, Fl. Zap. Sibiri XI, 2685; Majevski, Fl., Izd. 8, 567. —*Trimorphaea vulgaris* Cass. Dict. sc. nat. XXXVII (1825) 462. —*Conyzella coerulea* Rupr. Fl. ingr. (1860) 560. —*Trimorpha acre* S.F. Gray Nat. arr. Brit. pl. II (1821) 466. —*T. acris* Vierh. in Beih. Bot. Centralbl. XIX, 2 (1906) 423. —*Erigeron caespitans* Kom. Fl. p-ova Kamch. III (1930) 127. —*Trimorphaea caespitans* Kom. ibid. —*E*[*rigeron*]. *acer* auct., non L. (1753): Kitamura in Mém. Coll. Sc. Kyoto Imp. Univ., ser. B, XIII (1937) 324, p. p.

Biennial. Stems one (very rarely many), erect, 5–75 cm high, and 1–5 mm thick, branched above, leafy, green, sometimes reddish, some-
247 what densely covered with somewhat stiff, long, spreading, multicellular hairs and denser, short, appressed hairs, but also with short-stalked, capitate glands below capitula. Leaves green, soft, covered on both sides with somewhat dense, somewhat stiff, long, spreading, multicellular hairs; basal and lower cauline leaves oblanceolate, obtuse or acute, long-petiolate, entire (very rarely basal leaves with remote tiny, acute teeth), 1.5–10.0 cm long and 3–14 mm wide; middle and upper cauline leaves scattered, divergent from stem, entire, lanceolate, acute, sessile, 0.4–9.0 cm long and 0.6–7.0 mm wide. Inflorescence paniculate. Capitula usually numerous, 6–10 mm long and 11–21 mm wide. Involucral bracts linearly lanceolate, acute, green, less often reddish, somewhat densely covered with somewhat stiff, long, spreading, multicellular hairs, often mixed with short-stalked, capitate glands; inner bracts shorter than disk, 5–7 mm long and 0.5–0.8 mm wide; outer bracts almost half as long. Peripheral florets pubescent in upper half of tube and sometimes in lower part of ligule with appressed hairs, pistillate, of two types: outer ligulate, 5.1–7.0 mm long (of which tube 2.8–3.5 mm), ligule

pink, acuminate, about 0.25 mm wide; middle florets tubular, colorless, tube about 3.5 mm long; style longer than tube by 1.0–1.5 mm; some florets with short ligules; disk florets bisexual, tubular, five-toothed, yellow, 4.0–5.2 mm long, pubescent in upper half of tube with scattered, short, appressed hairs. Pappus double, outer bristles very short, inner 3.7–7.0 mm long; achenes oblong-lanceolate, compressed, 1.5–1.8 mm long, covered with semi-appressed hairs. Flowering VI–IX.

Meadows, pastures, wastelands, pine forests, birch forests, sandy and salt-marsh lands. —*European Part*: Karelia-Lapland, Dvina-Pechora, Baltic, Ladoga-Ilmen, Upper Volga, Volga-Kama, Upper Dnieper, Middle Dnieper, Volga-Don, Trans-Volga, Upper Dniester, Bessarabia, Black Sea Region, Crimea, Lower Don, Lower Volga; *Caucasus:* Ciscaucasia, Dagestan; western, eastern and southern Transcaucasia; *Western Siberia:* Ob Region, Upper Tobol, Irtysh, Altai; *Eastern Siberia:* Yenisei, Lena-Kolyma, Angara-Sayans, Dauria; *Far East:* Kamchatka, Okhotsk, Zeya-Bureya, Uda River area, Ussuri Region; *Soviet Central Asia:* Aralo-Caspian, Balkhash Region, Dzhungaria-Tarbagatai, Pamiro-Aalai, Tien Shan. *General distribution:* Scandinavia, Central Europe, Altai, Eurasia, western Mediterranean, Balkans-Asia Minor, Armenia and Kurdistan, Dzhungaria-Kashgaria, Mongolia, Japan, China, Beringia, North America. Described from western Europe. Type in London.

Note. E. acer L. has dense pubescence of somewhat stiff, simple hairs on stems, leaves, and involucral bracts, green stems and involucral bracts as well as small capitula on somewhat short branches of compact many-headed paniculate inflorescence.

E. elongatus Ldb. has pubescence of fine, appressed and glandular 248 hairs with a negligible admixture of somewhat stiff, simple hairs on the stem and leaf margin, reddish-brown stem and involucral bracts; inflorescence corymbose or corymbose-paniculate, lax, of somewhat less numerous and large capitula on long branches.

The diversity and abundance of intermediate forms in color, pubescence, shape of inflorescence and size of capitula can be explained on the basis of hybridization of these extraordinarily widespread species.

It is necessary to say that a major proportion of the plants preserved in herbaria under the names *E. acer* L. and *E. elongatus* Ldb. is their hybrids. Some of them have been described even as separate species. Such, it appears, are *E. uralensis* Less. in *Linnaea* IX (1834) 154; *E. brachycephalus* Lindb. f. in *Sched. pl. Finland-exsicc.* 21–42 (1944) 88, No. 1372 and *E. elongatiformis* (Novopokr.) Serg. in Krylov, *Fl. Zap. Sib.* XI (1949) 2687. nom. seminud. So far as *E. caespitans* Kom. (l. c.), is concerned, it is not distinguishable from typical *E. acer* L.

40. **E. kamtschaticus** DC. Prodr. V (1836) 290; Ldb. Fl. Ross. II, 488; Kom. Fl. p-ova Kamch. III, 425. —*E. acer* var. *manshuricus* Kom. in Tr. Peterb. Bot. Sada XXV, 2 (1907) 610; Kom. and Alis. Opredel. Rast. Dalnevost. Kr. II, 1017. —*E. elongatus* auct., non Ldb. (1829); Hultén, Fl. Kamtch. III (1929) 160, p. p. —*E. acer.* var. *droebachensis* auct., non Blytt (1861); Kitamura in Mem. Coll. Sc. Kyoto Imp. Univ., ser. B, XIII (1937) 325.

Biennial. Stem one (very rarely several), 15–110 cm high and 1–6 mm thick, erect, branched above, middle, green, very rarely reddish-brown, leafy, sparsely pubescent with long, spreading, multicellular hairs and numerous, particularly in upper part of stem, fine appressed hairs, but with dense, short-stalked, capitate glands below capitula, sometimes long hairs found only in lower part of stem. Leaves green, thin; basal and lower cauline leaves oblanceolate, acute, long-petiolate, 2–20 cm long and 3–27 mm wide, sparsely serrate-toothed, sometimes with remote teeth, sparsely covered on both sides with long, spreading, multicellular hairs; middle and upper cauline leaves scattered, divergent from stem, lanceolate, acute, sessile, entire, 0.3–11.0 cm long and 0.4–17.0 mm wide, sparsely covered on both sides or only ciliate along margin with long, spreading, multicellular hairs. Capitula in broad paniculate inflorescence, numerous, 6–10 mm long and 10–19 mm wide. Involucral bracts green, very rarely reddish, linearly lanceolate, acute, densely covered with short-stalked, capitate glands and sometimes with sparse, long, spreading, multicellular hairs; inner bracts shorter than disk, 5.0–6.5 mm long and 0.6–0.7 mm wide, outer almost half as long; peripheral florets pubescent in upper part of tube with sparse appressed hairs, pistillate of two types; outer ligulate, 5.6–6.3 mm long (of which 249 tube 2.6–3.6 mm), ligules about 0.25 mm wide, pale pink, acuminate; middle tubular, colorless tube 2.7–3.6 mm long, style longer than tube by 0.6–2.2 mm; some florets with short ligules; disk florets yellow, bisexual, tubular, five-toothed, 3.6–4.7 mm long, with scattered, fine, appressed hairs in upper half. Pappus double, outer bristles very short, inner 5.5–6.0 mm long; achenes oblongly lanceolate, compressed, 1.6–2.2 mm long, with sparse, semi-appressed hairs. Flowering VII–IX.

Wet grassy meadows among open birch woodlands, forests, forest edges, wastelands. —*Arctic:* Chukotka, Anadyr; *Western Siberia*: Ob Region, Irtysh, Altai; *Eastern Siberia:* Kamchatka (and Commander Islands), Okhotsk, Zeya-Bureya, Uda River area, Ussuri, Sakhalin regions. *General distribution:* Mongolia, Japan, China. Described from Kamchatka. Type in Geneva; isotype in Leningrad.

Note. Hultén (l. c.) absolutely without any basis put *E. kamtschaticus* DC. as a synonym of *E. elongatus* Ldb. These are separate good species as confirmed by the study of their types as well as extensive herbarium material. *E. kamtschaticus* DC. is distinguished from *E. elongatus* Ldb. by the broad paniculate inflorescence, pubescent and sparsely serrate-toothed basal and lower cauline leaves and usually green involucral bracts and stems.

In exactly the same way Kitamura (l. c.), without basis, named this species as *E. acer* var. *droebachensis* Blytt. For the taxonomic status of *E. dröbachiense* Fr. Müller, the basionym for the variety, see the note under *E. elongatus* Ldb.

The above characteristics of *E. kamtschaticus* DC. fully conform with the characters of *E. acer* var. *manshuricus* Kom. (l. c.). Thus, the description of the indicated variety was superfluous.

Sometimes we come across plants resembling *E. kamtschaticus* DC. in the Urals, Dzhungarian Alatau, and Tien Shan. Additional materials are essential for a final judgment about their species affinity.

E. kamtschaticus DC. hybridizes with *E. elongatus* Ldb. and *E. acer* L.

41. **E. podolicus** Bess. Enum. pl. Volh. (1822) 76 (nomen), 33, No. 1075 (descriptio, sub *E. asteroidi* Andrz.); Grossh. Opredel. Rast. Kavk., 442; Katina in Vizn. Rosl. URSR, 525; Majevski, Fl. Izd. 8, 567. — *Trimorpha podolica* Vierh. in Beih. Bot. Centralbl. XIX, 2 (1906) 423.

Biennial. Stem single (sometimes several), 15–100 cm high, and 1–6 mm thick, erect, branched only at tip, leafy, grayish-green, very rarely reddish, densely covered with stiff, more or less long, spreading, multicellular and fine appressed hairs. Leaves stiff, grayish-green, entire, densely covered on both sides with stiff, somewhat long, spreading, 250 multicellular hairs; basal and lower cauline leaves oblanceolate, obtuse or acute, long-petiolate, 2–12 cm long and 3–14 mm wide, basal leaves often withering before flowering; middle and upper cauline leaves dense, overlapping each other and subappressed, lanceolate, acute, sessile, 0.2–10.0 cm long and 0.3–12.0 mm wide. Capitula in compact, less often lax, corymbose-paniculate inflorescence, usually on short branches, rather numerous, 7–11 mm long and 12–23 mm wide. Involucral bracts stiff, grayish-green, linearly lanceolate, acute, densely covered with stiff, long, spreading, multicellular hairs, sometimes mixed with short-stalked, capitate glands; inner bracts shorter than disk, 4.7–8.0 mm long and 0.5–0.7 mm wide, outer almost half as long as inner ones; peripheral florets in upper part of tube and in lower part of ligule puberulent with appressed hairs, pistillate, of two types: outer ligulate, 6.1–7.0 mm long (of which tube 2.8–3.5 mm), pink, obtuse, ligule about 0.3 mm wide; inner tubular, tube colorless, 2.7–4.5 mm long, style longer than tube by 1.0–1.7 mm; disk florets bisexual, tubular, five-toothed, yellow, 3.5–5.0 mm long, pubescent in upper half of tube with appressed hairs.

Pappus double, outer bristles very short, inner 5.5–7.0 mm long; achenes oblongly lanceolate, compressed, 1.6–2.5 mm long, covered with semiappressed hairs. Flowering VI–IX.

Sandy, saline soils, gravel-beds, grassy areas. —*European Part:* Volga-Kama, Upper Dnieper, Middle Dnieper, Trans-Volga, Upper Dniester, Bessarabia, Black Sea Coast, Crimea, Lower Don, Lower Volga; *Caucasus*: Ciscaucasia, Dagestan, eastern Transcaucasia; *Western Siberia*: Upper Tobol (southern part), Irtysh; *Soviet Central Asia*: Aralo-Caspian, Balkhash, Dzhungaria-Tarbagatai, Kara-Kum, Pamiro-Alai, Tien Shan. *General distribution*: Central Europe. Described from eastern Podolia (from Dniester area). Type in Leningrad.

Note. E. podolicus Bess. quite often hybrdizes with *E. acer* L.

42. **E. baicalensis** Botsch. in Addenda XXIV, 584.

Biennial. Stems one or several, erect, branched only in upper part, leafy, reddish, 10–42 cm high and 1–4 mm thick, sparsely covered with long, somewhat stiff, spreading multicellular and very fine, upwardly strigose hairs, sometimes with only the fine hairs. Leaves entire, green or reddish, on both sides or only along margin sparsely pubescent with stiff, spreading, multicellular hairs, sometimes mixed with short, appressed hairs; basal leaves usually withering before flowering, oblanceolate, acuminate or obtuse, 3–17 cm long and 3–13 mm wide, cauline leaves numerous, dense, subappressed and covering it, 0.5–11.0 cm long and 0.6–15.0 mm wide, lower leaves like basal, upper lanceolate, acute, sessile. Inflorescence compact, more or less corymbose; capitula on 251 short peduncles, less numerous, 7–12 mm long and 14–25 mm wide. Involucral bracts shorter than disk, linearly lanceolate, acute, reddish or green, covered with long, somewhat stiff, spreading, multicellular hairs; inner bracts 6–8 mm long and 0.6–0.7 mm wide, outer almost half as long as inner ones. Peripheral florets pistillate, of two types: outer ligulate, 6.0–7.6 mm long (of which tube 3–4 mm), pubescent in upper half of tube with appressed hairs, ligules bright lilac, about 0.4 mm wide; middle florets tubular, 2.5–2.8 mm long, colorless, pubescent in upper half with appressed hairs, style longer than tube by 1.2–2.5 mm. Disk florets yellow, bisexual, tubular, five-toothed, 4.5–5.0 mm long, pubescent in upper half with appressed hairs. Pappus two-rowed, outer bristles very short, inner 6.7–7.5 mm long; achenes oblongly lanceolate, compressed, 1.9–2.0 mm long, covered with subappressed hairs. Flowering VII–IX.

Mountains, river valleys, meadows and steppe slopes. —*Eastern Siberia*: Angara-Sayans, Dauria. *General distribution*: Mongolia. Described from the Nerchinsk Range. Type in Leningrad.

43. **E. elongatus** Ldb. Icon. pl. Fl. ross. I (1829) 9, tab. 31; Ldb. Fl. Ross. II, 487; Krylov, Fl. Zap. Sib. XI, 2688; Popov in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, No. 7, 11. — ? *E. angulosus* Gaud. Fl. Helv. V (1829) 265. —*E. politus* Fries, Summa veg. scand. (1846) 184. — *Trimorpha elongata* Vierh. in Beih. Bot. Centralbl. XIX, 2 (1906) 424. —? *T. angulosa* Vierh. Ibid. p. 423. —*T. polita* Vierh. Ibid p. 424. — *Erigeron elongatus* auct., non Ldb. (1829): Hultén Fl. Kamtch. III (1929) 160, p. p.

Biennial or perennial. Stems usually several, erect, branched above, reddish-brown, less often green, leafy, 5–80 cm high and 1–5 mm thick, pubescent with dense fine appressed hairs, sometimes with negligible admixture of somewhat stiff, long, spreading, multicellular hairs, but with only short-stalked, capitate glands below capitula. Leaves entire, somewhat stiff, green, sometimes with reddish petioles, glabrous or mostly ciliate with long multicellular hairs; basal and lower cauline leaves oblong or oblanceolate, obtuse, long-petiolate, 1–10 cm long and 1–11 mm wide; middle and upper cauline leaves oblong or lanceolate, acute, sessile, 0.3–9.0 cm long and 0.7–8.0 mm wide. Capitula in corymbose or corymbose-paniculate inflorescence, often on long peduncles, usually not numerous, 7–11 mm long and 12–22 mm wide. Involucral bracts linearly lanceolate, acute, reddish-brown, very rarely green, densely glandular-hairy with short-stalked, capitate glands, sometimes mixed with long, spreading, stiff, multicellular hairs; inner bracts shorter than disk, 4.5–9.0 mm long and 0.5–1.0 mm wide, outer almost half as long. 252 Peripheral florets sparsely puberulent in upper part of tube with appressed hairs, pistillate, of two types: outer ligulate, 6.3–8.0 mm long (of which tube 2.3–4.3 mm), ligules obtuse, pink or lilac, 0.3–0.5 mm long; middle tubular, with colorless tube 2.5–4.9 mm long, style pink or lilac, longer than tube by 1.0–1.7 mm; some pistillate florets with short ligules. Disk florets bisexual, tubular, five-toothed, 3.5–5.2 mm long, sparsely pubescent in upper half of tube with appressed hairs; teeth dark lilac. Pappus double, outer bristles very short, inner 4.5–7.3 mm long; achenes oblongly lanceolate, compressed, 1.8–2.5 mm long, densely covered with semi-appressed hairs. Flowering VI–IX. (Plate XVI, Fig. 3).

Meadows, seashore, among stones and on sand bars, in forests and pine forests, abandoned fields and wastelands; mountains in subalpine meadows, forests, stony alluvial deposits and gravel beds. —*Arctic*: Arctic Europe, Arctic Siberia, Chukchi, Anadyr; *European Part*: Karelia-Lapland, Dvina-Pechora, Ladoga-Ilmen, Upper Volga, Upper Dnieper, Volga-Kama, Volga-Don; *Caucasus*: Ciscausia, western and eastern Transcaucasia; *Western Siberia*: Ob Region, Upper Tobol, Irtysh, Altai; *Eastern Siberia*: Yenisei, Lena-Kolyma, Angara-Sayans, Dauria; *Far East*: Kamchatka, Okhotsk, Zeya-Bureya, Uda River area, Ussuri, Sakhalin regions; *Soviet Central Asia*: Dzhungaria-Tarbagatai, Tien Shan. *General distribution*: Scandinavia, Central Europe, Western Mediterranean, Dzhungaria-Kashgaria, Mongolia, Beringia, North America. Described from Altai. Type in Leningrad.

Note. In the note under *E. acer* L. (cf. above) reference was made to extensive hybridization of *E. acer* L. and *E. elongatus* Ldb. There also the opinion was set forth that some of the species described by various authors are hybrid in nature.

Probably *E. dröbachiense* Fr. Müller, *Fl. Danica* V, 15 (1782) 4, tab. 874, is such a hybrid of *E. acer* L. and *E. elongatus* Ldb., to judge from the illustration cited. Therefore, one must consider as baseless the efforts of some botanists to regard *E. elongatus* Ldb. as a synonym of *E. dröbachiense* Fr. Müller, although it was described considerably earlier than *E. elongatus* Ldb.

Section 2. MACROGLOSSAE Vierh. in Beih. Bot. Centralbl. XIX, 2 (1906) 424. —Ligules considerably longer than disk, very rarely only slightly longer than it. Pappus two to two and one-half times as long as achenes, involucre shorter than or almost as long as disk. Perennials.

44. **E. alpinus** L. Sp. pl. (1753) 864; Grossh. Fl. Kavk. Izd. 1, IV, 97; Katina in Vizn. Rosl. URSR, 525. —*Trimorpha alpina* S.F. Gray Nat. arr. Brit. pl. II (1821) 467. —*T. alpina* Vierh. in Bieh. Bot. Centralbl. XIX, 2 (1906) 425. —**Exs.**: GRF No. 2775.

Perennial. Rhizome branched. Stems several, 6–25 cm high, and 1–2 mm 253 thick, erect, or ascending, single-headed, leafy, green or reddish, densely covered with somewhat stiff, long, spreading multicellular and short appressed hairs. Leaves entire, grayish-green, densely pubescent with somewhat stiff, spreading, multicellular hairs; basal leaves oblanceolate, obtuse or acute, long-petiolate, 1–7 cm long and 2–9 mm wide; cauline leaves lanceolate, acute, sessile, 0.6–6.0 cm long and 1–10 mm wide. Capitulum 9–14 mm long and 1.9–3.0 cm wide. Involucral bracts green or reddish, densely covered with somewhat stiff, colorless, spreading, long, multicellular hairs; inner bracts as long as disk, 6–9 mm long and 0.7–1.0 mm wide, outer slightly shorter than inner ones. Peripheral florets covered with long, appressed hairs in upper part of tube, pistillate, of two types: outer ligulate, 7.5–8.5 mm long (of which tube 2.5–3.0 mm), ligules pink, about 0.8 mm wide; middle tubular, colorless, tube 2.5–3.0 mm long, pink, style longer than tube by 1.0–1.1 mm. Disk florets 3.7–4.5 mm long, bisexual, tubular, five-toothed, pubescent in upper half of tube with appressed hairs, teeth pink. Pappus double, outer bristles very short, inner 4.6–5.2 mm long; achenes lanceolate, compressed, 2.5–2.9 mm long; covered with long, semi-appressed hairs. Flowering VII–VIII.

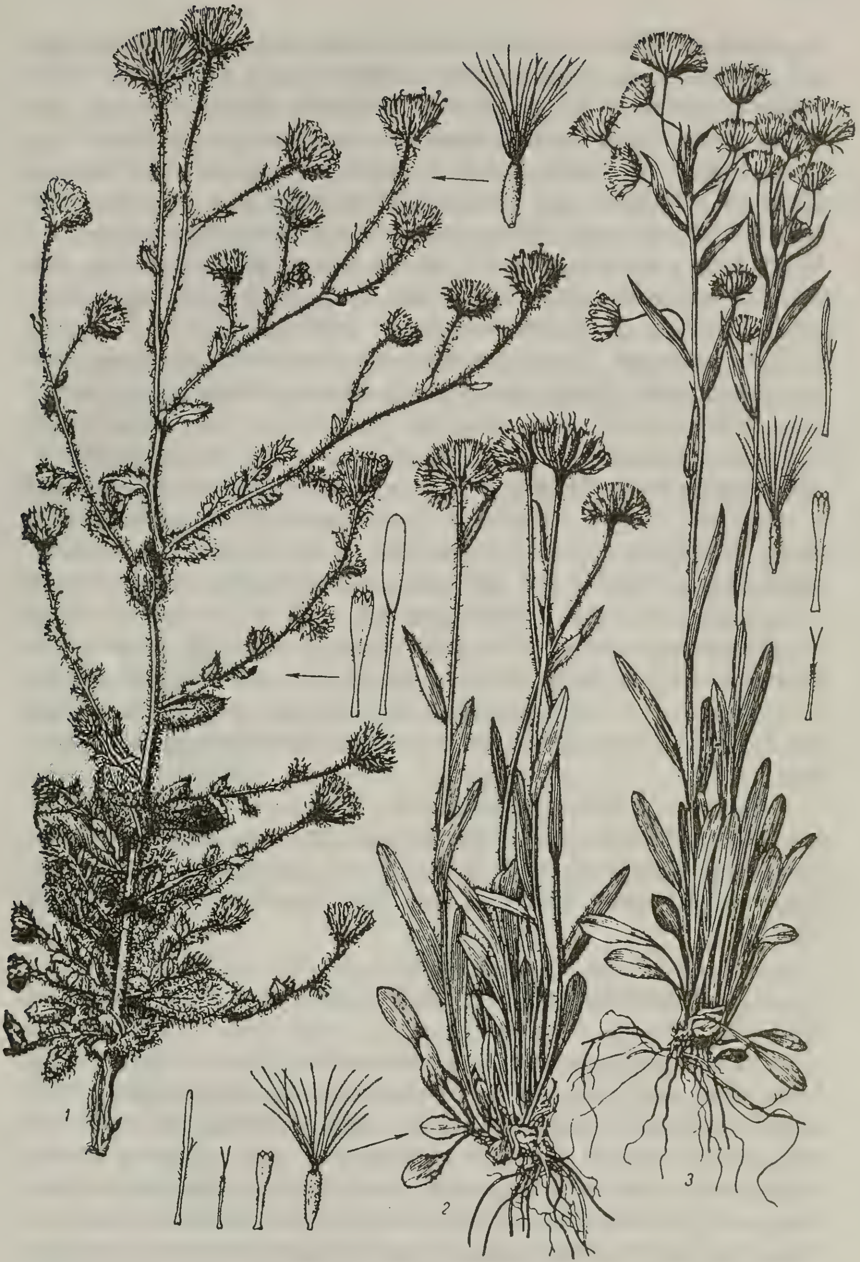
Mountains in subalpine zone, alpine meadows, crevices of rocks and moraines at 1,800–3,200 m. —*European Part*: Upper Dniester; *Caucasus*: Ciscaucasia, Dagestan, eastern Transcaucasia. *General distribution*: Central Europe, Atlantic Europe, western Mediterranean, Balkans-Asia Minor, Armenia and Kurdistan. Described from Switzerland. Type in London.

45. **E. borealis** (Vierh.) Simm. in Acta Univers. Lundensis, nov. ser., Afd. 2, t. IX, No. 19 (1913) 127. —*Trimorpha borealis* Vierh. in Beih. Bot. Centralbl. XIX, 2 (1906) 447. —*E. alpinus* auct., non L. (1753): Krylov, Fl. Zap. Sib., XI (1949) 2690. —*E. uniflorus* auct., non L. (1753): Mishkin, Fl. Khib. Gor. (1953) 67.

Perennial. Rhizome branched; stems several, simple, less often branched, green or reddish, 5–27 cm high and 1–3 mm thick, leafy, sparsely covered with soft, long, spreading, multicellular and numerous, short, appressed hairs. Leaves entire, green, very rarely reddish, pubescent on both sides, sometimes basal leaves only ciliate, with long, soft, spreading multicellular hairs; basal leaves oblanceolate, obtuse or acute, long-petiolate, 0.7–8.0 cm long and 2–7 mm wide; cauline leaves 0.6–5.0 cm long and 1–6 mm wide; lower leaves like basal, upper lanceolate, acute, sessile. Capitula usually solitary, very rarely two to six, 7–11 mm long and 1.5–2.5 cm wide. Involucral bracts reddish, densely covered with long, fine, soft, intertwined, multicellular hairs, usually with dark colored septa; inner bracts more or less as long as disk, 254 linearly lanceolate, acute, 6–8 mm long and 0.6–1.0 mm wide, outer ones slightly shorter than inner. Peripheral florets sparsely pubescent with appressed hairs in upper part of tube, pistillate, of two types: outer ligulate 5.5–7.0 mm long (of which tube 2.5–2.8 mm), ligules pink, lilac or violet, 0.4–0.6 mm wide; middle tubular, colorless, 2.0–2.5 mm long; style longer than tube by 1.4–2.0 mm. Disk florets 3.7–4.5 mm long, bisexual, tubular, five-toothed, sparsely puberulent in upper part of tube with appressed hairs, lobes or teeth of same color as ligules. Pappus double, outer bristles very short, inner 4.2–4.8 mm long; achenes oblongly lanceolate, compressed, 1.8–2.5 mm long, pubescent with semi-appressed hairs. Flowering VII–IX. (Plate XVI, Fig. 2).

In tundra on dry slopes, sands, and moraine ridges, in mountains on rocks, stony slopes and alpine grassy meadows. —*Arctic*: Arctic Europe, Kolguev Island, Arctic Siberia; *European Part*: Karelia-Lapland (north), Dvina-Pechora (north); *Western Siberia*: Ob Region (north). Described from Scandinavia. Type probably in Vienna.

46. **E. krylovii** Serg. in Sist. Zap. Gerb. Tomsk. Univ. I (1945) 2; Krylov, Fl. Zap. Sib. XI, 2689.



255

Plate XVI.

1—*Lachnophyllum gossypinum* Bge., habit; achene, bisexual floret, ligulate floret; 2—*Erigeron borealis* (Vierh.) Simm., habit; ligulate floret tubular pistillate floret, bisexual floret, achene; 3—*E. elongatus* Ldb., habit; achene, ligulate floret, bisexual floret, tubular pistillate floret.

Perennial. Rhizome many-headed. Stems several, 14–60 cm high and 1–4 mm thick, erect, green or reddish, leafy, branched in inflorescence, sparsely covered with long, spreading, multicellular hairs and dense, short-stalked, capitate glands. Leaves green, entire, ciliate with long, multicellular hairs, densely covered with short-stalked, capitate glands on both sides, sometimes mixed with some long, erect, multicellular hairs; basal leaves oblanceolate, obtuse or acute, long-petiolate, 3–15 cm long and 4–18 mm wide; cauline leaves 0.5–12.0 cm long and 0.7–20.0 mm wide, lower leaves like basal, upper lanceolate, acute, sessile. Capitula in corymbose-racemose inflorescence, less numerous, 9–13 mm long and 1.7–2.5 cm wide. Involucral bracts linearly lanceolate, acute, green, densely covered with stalked, capitate glands, sometimes with scattered, long, spreading, multicellular hairs; inner bracts shorter or sometimes almost as long as disk, 5.5–7.5 mm long and 0.7–1.0 mm wide, outer almost half as long as inner ones. Peripheral florets in upper half of tube pubescent with appressed hairs, pistillate, of two
257 types: outer ligulate, 7.5–10.2 mm long (of which tube 2.5–3.9 mm), ligule bright pink, 0.4–0.6 mm wide, middle tubular, colorless, tube 2.1–3.8 mm long, pink style longer than tube by 0.5–1.2 mm. Disk florets bisexual, tubular, five-toothed, 3.6–5.2 mm long, pubescent in upper half of tube with appressed hairs, lobes pink. Pappus double, outer bristles very short, inner 4.3–5.0 mm long; achenes lanceolate, flat, 2.2–2.5 mm long, densely pubescent with semi-appressed hairs. Flowering VII–IX.

Mountains in alpine region, on stony slopes and rocks, in subalpine meadows and forests. —*Western Siberia*: Altai; *Soviet Central Asia*: Dzhungaria-Tarbagatai, Tien Shan. *General distribution*: Dzhungaria-Kashgaria? Mongolia? Described from Altai. Type in Tomsk; isotype in Leningrad.

47. **E. violaceus** M. Pop. in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, No. 7 (1948) 11.

Perennial. Rhizome branched. Stems several, 8–50 cm high and 1–3 mm thick, erect, branched in inflorescence, very rarely simple, leafy, green or reddish, sparsely covered with long, spreading, stiff, multicellular hairs as well as numerous short-stalked, capitate glands. Leaves entire, green, ciliate with long, multicellular hairs, but with similar hairs mixed with short-stalked, capitate glands or only glandular on both sides; basal leaves oblanceolate, obtuse, long-petiolate, 2–12 cm long and 3–14 mm wide; cauline leaves 0.5–10.0 cm long and 3–13 mm wide; lower leaves like basal, upper sessile, acute, lanceolate. Capitula less numerous, in corymbose inflorescence, less often solitary, 9–14 mm long and 1.7–3.0 cm wide. Involucral bracts green, linearly lanceolate, acute, densely covered with short-stalked, capitate glands, sometimes mixed with sparse, long, spreading, multicellular hairs; inner bracts as long as disk or slightly shorter, 5.0–7.5 mm long and 0.7–1.0 mm wide, outer almost as long as inner ones. Peripheral florets sparsely puberulent in upper half of tube with appressed hairs, pistillate, of two types: outer ligulate, 8.5 mm long (of which tube 3.0–3.5 mm), ligules violet, about 0.6 mm wide; middle tubular, colorless, tube 2.8–3.0 mm long, violet; style longer than tube by 1.0–1.5 mm. Disk florets bisexual, tubular, five-toothed, 4.2–5.0 mm long, pubescent with sparse appressed hairs throughout tube, lobes violet. Pappus two-rowed, outer bristles very short, inner about 4.5 mm long; achenes lanceolate, compressed, about 2.1 mm long, covered with rather long, semi-appressed hairs. Flowering VI–VIII.

258 Mountains, subalpine and alpine meadows. —*Soviet Central Asia*: Tien Shan (Trans-Ili Alatau), Endemic. Described from the vicinity of Alma-Ata. Type in Leningrad.

Note. M.G. Popov, while describing *L. violaceus* M. Pop., did not indicate its type. I am, therefore, selecting one of the few specimens signed by him as the lectotype: Kaz. SSR. Trans-Ili Alatau. Upper reaches of the River M. Almatinka. "Vorota" 2,000 m, 12.VIII.1933, N. Rubtsov. Preserved in the herbarium of the Botanical Institute of the Academy of Sciences of the USSR, Leningrad.

E. violaceus M. Pop. represents a race of *E. krylovii* Serg. with violet ligules, narrowly localized in Trans-Ili Alatau.

48. **E. pseudoseravschanicus** Botsch. in Addenda XXIV, 585. — *E. alpinus* auct., non L. (1753): O. and B. Fedtsch. Perech. Rast. Turk. IV (1911) 166, p. p.; Popov in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, No. 7 (1948) 11.

Perennial. Rhizome branched. Stems several, erect, branched, green, sometimes reddish, 5–60 cm high and 1–3 mm thick, covered with long, spreading, multicellular hairs and stalked, capitate glands, sometimes mixed with short appressed hairs. Leaves green, entire, sparsely covered with long, spreading, multicellular hairs on both sides, sometimes only ciliate, but covered with stalked, capitate glands on both sides; basal leaves lanceolate, acute, long-petiolate, 2–15 cm long and 3–16 mm wide; cauline leaves 0.3–13.0 cm long and 0.5–11.0 mm wide; lower leaves like basal, upper lanceolate, acute, sessile. Inflorescence corymbose-racemose; capitula usually numerous, 7–14 mm long and 1.3–3.0 cm wide. Involucral bracts green, sometimes reddish, slightly shorter than disk, linearly lanceolate, acute, pubescent with long, erect, multicellular hairs mixed with stalked, capitate glands, sometimes glands predominating; inner bracts 5.0–6.5 mm long, and 0.8 mm wide, outer almost half as long. Peripheral florets in upper part of tube pubescent with sparse appressed hairs, pistillate, of two types: outer ligulate, 5.8–8.5 mm long (of which tube 2.2–3.5 mm), ligules pink or lilac, about 0.3 mm wide; middle florets tubular, colorless, tube 2.2–3.0 mm long, style longer than tube by 1.1–1.5 mm. Disk florets bisexual, tubular, 4.0–4.7 mm long, five-toothed (teeth pink), pubescent in upper part of tube with sparse appressed hairs. Pappus two-rowed, outer bristles very short, inner 4.0–5.3 mm long; achenes oblong-lanceolate, compressed, 2.0–2.2 mm long, densely pubescent with semi-appressed hairs. Flowering VII–IX.

Mountains, on grassy slopes as well as among trees and shrubs, at 3,000 m. —*Western Siberia*: Altai; *Soviet Central Asia*: Dzhungaria-
259 Tarbagatai, Pamiro-Alai, Tien Shan. *General distribution*: Dzhungaria-Kashgaria. Described from the Alai Range. Type in Leningrad.

Note. The species described above is very similar to *E. seravschanicus* M. Pop., but belongs to another subgenus because it has both tubular and ligulate pistillate florets.

In *E. pseudoseravschanicus* m. long hairs are predominant, but the lower part of stem only is covered with them. This character distinguishes it from the very close species *E. krylovii* Serg.

49. **E. tianschanicus** Botsch. nom. nov. —*E. coeruleus* M. Pop. in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, No. 7 (1948) 11, non Urb. (1913). —*E. alpinus* auct., non L. (1753): O. and B. Fedtsch. Perech. Rast. Turk. IV (1911) 166, p. p.

Perennial. Rhizome branched. Stems several, green or reddish, 5–60 cm high and 1–3 mm thick, leafy branched, covered with spreading, long, multicellular hairs and stalked, capitate glands, sometimes mixed with short, appressed hairs. Leaves green, entire, sparsely covered on both sides with long, spreading, multicellular hairs, often mixed with stalked, capitate glands, sometimes only ciliate, but on both sides covered with stalked, capitate glands; basal leaves oblanceolate or lanceolate, acute, long-petiolate, 2–15 cm long and 2–17 mm wide; cauline leaves 0.4–16.0 cm long and 0.7–17.0 mm wide; lower leaves like basal, upper lanceolate, acute, sessile. Inflorescence corymbose-racemose; capitula numerous, 7–11 mm long and 1.4–2.3 cm wide. Involucral bracts slightly shorter than disk, green, linearly lanceolate, acute, sparsely covered with long, spreading, multicellular hairs and numerous stalked, capitate glands, inner bracts 5–7 mm long and 0.5–0.8 mm wide, outer almost half as long as inner ones. Peripheral florets pubescent in upper half of tube with appressed hairs, pistillate, of two types: outer ligulate, 5.9–8.0 mm long (of which tube 2.5–3.0 mm), ligules blue, about 0.5 mm wide; middle florets tubular, 2.3–2.9 mm long, blue, style exceeding tube by 0.5–1.7 mm. Disk florets bisexual, tubular, five-toothed (teeth blue), 3.4–4.1 mm long, pubescent in upper half of tube with sparse appressed hairs. Pappus two-rowed, outer bristles very short, inner 4.0–4.8 mm long; achenes oblong-lanceolate, compressed, 2.0–2.2 mm long, pubescent with semi-appressed hairs. Flowering VII–VIII.

Mountains, grassy slopes or among trees and shrubs. —*Soviet Central Asia:* Dzhungaria-Tarbagatai, Pamiro-Alai, Tien Shan. *General distribution*: Dzhungaria-Kashgaria. Described from Trans-Ili Alatau. Type in Alma-Ata.

Note. The type of the species was not indicated in the description 260 of *E. coeruleus* M. Pop. As lectotype I recommend one of the few specimens signed by M.G. Popov himself: Kaz. SSR. Trans-Ili Alatau. Northern slope. River Koturbulak between Talgar and M. Almatinka. Spruce forest zone. Open herb meadows. 4–5.VIII.1933, fl. et fr., M.G. Popov. Preserved in the herbarium of the Institute of Botany of the Academy of Sciences of Kazakh SSR in Alma-Ata.

E. coeruleus M. Pop. is a later homonym; therefore, here the species is given a new name—*E. tianschanicus* m.

E. tianschanicus m. has its range in common with *E. pseudoseravschanicus* m. and is distinguished from it only by blue ligules and, therefore, is a colored race of the latter.

50. **E. bellidiformis** M. Pop. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, VIII (1940) 56.

Perennial. Rhizome many-headed. Stems several, erect, simple or slightly branched, green or reddish, leafy, sparsely covered with long, spreading, multicellular and numerous fine, appressed hairs, 8–20 cm high and 1.0–1.5 mm thick. Leaves green, entire, on both sides sparsely covered with long, spreading, multicellular hairs; basal leaves oblanceolate, obtuse, long-petiolate, 1.5–11.0 cm long and 3–10 mm wide; cauline leaves 0.4–7.0 cm long and 0.6–8.0 mm wide, lower leaves like basal, upper lanceolate, acute, sessile. Capitula solitary, very rarely two to four, 7–8 mm long and 14–17 mm wide. Involucral bracts linearly lanceolate, acute, green, apically reddish, more or less densely covered with stiff, long, spreading, multicellular hairs; inner bracts slightly shorter than disk, 5.5–7.5 mm long and about 0.6 mm wide, outer slightly shorter. Peripheral florets in upper part of tube with occasional, fine, appressed hairs, pistillate, of two types: outer ligulate, about 5.3 mm long (of which tube 2.6 mm) ligules scarcely exserted from disk, pink, about 0.2 mm wide; middle florets pistillate, less numerous, colorless, with tube about 2.5 mm long and style longer than tube by 0.7 mm; disk florets bisexual, tubular, five-toothed, about 3.8 mm long, sparsely puberulent with appressed hairs in upper part of tube, lobes pink. Pappus two-rowed, outer bristles very short, inner about 4.5 mm long; achenes lanceolate, compressed, about 2.5 mm long, covered with fine, semi-appressed hairs. Flowering VII–VIII.

Mountains, turf or gravel slopes, as well as juniper forests, at 3,000 m. *Soviet Central Asia:* Pamiro-Alai. Endemic. Described from the Zeravshan Range. Type in Tashkent.

Note. Two plants were mentioned in the description of this species, I am selecting the first of them as the lectotype of *E. bellidiformis* M. Pop.: Zeravshan Range, north slope facing the Zeravshan glacier. Turf slope, 16.VII.1927, No.170, V. Drobov. Lectotype preserved in the herbarium of the Soviet Central Asian State University, Tashkent.

261 51. **E. orientalis** Boiss. Diagn. ser. II, 3 (1856) 7; Grossh. Fl. Kavk. Izd. 1, IV, 97. —*E. acre* β. *confertum* Boiss. Fl. or. III (1875) 166. — *E. kopetdagensis* M. Pop. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, VIII, (1940) 50.

Perennial. Rhizome branched. Stems usually several, erect, branching in inflorescence, leafy, grayish-green or reddish, 3–60 cm high and 1–4 mm thick, densely, sometimes very sparsely, covered with stiff, long, spreading, multicellular and short, appressed hairs mixed with, particularly below capitula, stalked capitate glands. Leaves stiff, entire (very rarely basal leaves with solitary, small, acute teeth), grayish green, densely (less often sparsely) covered on both sides with stiff, long, spreading, multicellular hairs; basal leaves oblanceolate, acute, long-petiolate, 2–15 cm long and 3–16 mm wide; cauline leaves 0.3–12.0 cm long and 0.5–12.0 mm wide, lower leaves like basal, upper lanceolate, acute, sessile. Capitula in corymbose-racemose inflorescence, less numerous, 7–13 mm long and 1.3–2.7 cm wide. Involucral bracts linearly lanceolate, acute, grayish-green, less often reddish, densely (sometimes sparsely) covered with stiff, long, spreading, multicellular hairs mixed with, particularly at apex, short-stalked, capitate glands; inner bracts shorter than disk, 5.5–7.5 mm long and 0.8–1.0 mm wide, outer almost half as long as inner ones. Peripheral florets pistillate, of two types: outer ligulate, 5.5–8.6 mm long (of which tube 2.2–3.6 mm), covered in upper part of tube and lower part of ligule with long, appressed hairs; ligule pink, 0.4–0.6 mm wide, middle tubular, colorless, with long, appressed hairs above, tube 2.5–3.9 mm long, pink, style longer than tube by 0.8–1.3 mm; some pistillate florets with short ligules; disk florets bisexual, tubular, 3.8–5.3 mm long, pubescent throughout tube with appressed hairs, teeth pink. Pappus double, outer bristles very short, inner 4.0–5.8 mm long; achenes oblong-lanceolate, compressed, 1.7–2.5 mm long, pubescent with semi-appressed hairs. Flowering VII–IX.

Mountains, steppe slopes and forest glades, alpine and subalpine meadows, stony and gravelly slopes, at 1,200–2,800 m. —*European Part:* Crimea; *Caucasus:* All regions; *Soviet Central Asia*: Mountainous Turkmenia (Kopetdag). *General distribution:* Armenia and Kurdistan, Iran. Described from north Iran. Type in Geneva; isotype in Leningrad.

Note. E. kopetdagensis M. Pop. (l. c.) was listed by its author under the subgenus *Euerigeron.* However, during the study of its type (the only specimen of this species) different pistillate florets were found in it: the peripheral florets had ligules to 4.3 mm long, but the inner ones up to 2.5 mm. Such a feature is quite common in the subgenus *Trimorpha* and is not characteristic of subgenus *Euerigeron.* The other plants—collected from different places in the Kopetdag being, in all their characters, 262 even such subtle ones as the nature of the pubescence of the florets, absolutely identical to *E. kopetdagensis* M. Pop., together with ligulate florets, which develop both long and shortened ligules—have distinct tubular pistillate florets. Hence, they are typical representatives of the subgenus *Trimorpha,* but in this subgenus they are not distinguishable from *E. orientalis* Boiss. True, it is possible that in due course plants will be collected in the Kopetdag in which the pistillate florets will have only normal, long ligules, and there will not be any tubular pistillate florets and florets with short ligules. Then, it will be possible to say that *E. kopetdagensis* M. Pop. is a separate species of the other subgenus and that in the Kopetdag one can observe the tendency characteristic of other mountain massifs of Soviet Central Asia, where races, in essence, of one species formally relate to different subgenera of the genus *Erigeron* L. (e.g., *E. schmalhausenii* M. Pop. and *E. pseuderiocephalus* M. Pop.). At present, there is no basis to distinguish *E. kopetdagensis* M. Pop. from *E. orientalis* Boiss.

In the USSR, *E. orientalis* Boiss. was reported earlier only from the Caucasus. However, the rich collection of the herbarium of the Botancial Institute of the Academy of Sciences of the USSR shows that besides in the Caucasus, *E. orientalis* Boiss. is distributed in Crimea and Kopetdag also.

52. **E. hissaricus** Botsch. in Addenda XXIV, 586.

Perennial. Caudex branched, many-headed. Stems green, erect, leafy, branching only in inflorescence, sparsely covered with long, spreading, multicellular as well as numerous upwardly strigose, short hairs and short-stalked, capitate glands. Leaves soft, green, entire, sparsely, covered on both sides with long, multicellular, spreading hairs, less often leaves only ciliate; basal leaves oblanceolate, obtuse, long-petiolate, 3–10 cm long and 5–16 mm wide; cauline leaves 0.4–10.0 cm long and

0.5–14.0 mm wide, lower leaves like basal, uppper lanceolate, acute, sessile. Inflorescence corymbose-racemose; capitula less numerous, 8–11 mm long and 1.5–2.0 cm wide. Involucral bracts shorter than disk, green, linearly lanceolate, acute, covered with very long, stiff, spreading, multicellular hairs and stalked, capitate glands; inner bracts 6.5–8.5 mm long and 0.7 mm wide, outer half as long. Peripheral florets sparsely pubescent throughout tube with appressed hairs, pistillate, of two types: outer ligulate, 6.0–6.8 mm long (of which tube 3.0–3.5 mm), ligules pale pink, about 0.3 mm wide, middle tubular, colorless, 3.0–3.5 mm long, style longer than tube by 1.4 mm, some pistillate florets with short ligules; disk florets bisexual, 4.5–5.0 mm long, tubular, five-toothed, 263 with pinkish teeth, pubescent in upper half of tube with sparse appressed hairs. Pappus two-rowed, outer bristles very short, inner 4.5–6.5 mm long, achenes oblong-lanceolate, compressed, 2.5–3.5 mm long, pubescent with somewhat stiff, semi-appressed hairs. Flowering VI–VIII.

Mountains, rocks, at 1,500–2,600 m. —*Soviet Central Asia:* Pamiro-Alai. Endemic. Described from the Gissar Range. Type in Leningrad.

Note. E. hissaricus m. is close to *E. schmalhausenii* M. Pop., but is well distinguished from it by green, erect stems and broader, oblanceolate, not coriaceous leaves, usually hairy on both sides.

In the range of *E. hissaricus* m. we find plants resembling it but without tubular pistillate florets (e.g., the Kugifrush Mountain, 12.IX.1935, No. 1410, I. Linczevsky and T. Maslennikova). Probably here we are confronted with a phenomenon quite prevalent among Soviet Central Asian fleabanes, in which the plants are of two types: one form with ligulate and tubular pistillate florets (e.g. *E. schmalhausenii* M. Pop.), and the other form with only ligulate pistillate florets (e.g., *E. pseuderiocephalus* M. Pop.). However, the limited material does not enable us to describe plants from the Kugifrush Mountain as a separate species close to ours, but in the other subgenus of the genus *Erigeron* based on the formal characters.

53. **E. badachschanicus** Botsch. in Addenda XXIV, 586.

Perennial. Stems several, 25–52 cm high and 1–2 mm thick, erect, branched, leafy, green above, reddish in lower half, sparsely covered with long, stiff, spreading, multicellular and short, upwardly strigose hairs mixed with considerable number of capitate glands below capitula. Basal leaves oblanceolate, obtuse, long-petiolate, serrate-crenate, ciliate with long, multicellular hairs, but on both sides pubescent with appressed hairs, green, with reddish petioles and veins, 2.5–13.0 cm long and 3–18 mm wide; cauline leaves sessile, lanceolate, acute, entire, green, with scattered long cilia, on both sides puberulent with appressed hairs, 0.3–3.5 cm long and 0.25–4.0 mm wide. Inflorescence paniculate;

capitula 8–10 mm long and 12–20 mm wide, on long, slender peduncles. Involucral bracts reddish, shorter than disk, linearly lanceolate, acute, densely glandular with short-stalked capitate glands, inner bracts 4.5–5.0 mm long and 0.7–0.9 mm wide, outer almost half as long. Peripheral florets pistillate, of two types: outer ligulate, 6–7 mm long, of which tube 3 mm and pubescent throughout with appressed hairs, ligules blue, about 0.5 mm wide; middle tubular, colorless, about 2.5 mm long, with tube pubescent throughout with appressed hairs, style blue, longer than tube by 1.7 mm; some pistillate florets with short 264 ligules; disk florets bisexual, tubular, five-toothed, yellow with blue teeth, pubescent throughout tube with sparse, appressed hairs, 4.5–5.7 mm long. Pappus two-rowed, outer bristles very short, inner about 5.2 mm long; achenes oblong-lanceolate, compressed, about 2.5 mm long, densely pubescent with semi-appressed, somewhat stiff hairs. Flowering VIII–IX.

Banks of irrigation ditches and streams, at 2,300 m. —*Soviet Central Asia:* Pamiro-Alai (western Pamir). Described from Khorog City. Type in Leningrad.

54. **E. pseudelongatus** Botsch. in Addenda XXIV, 587.

Perennial. Stems 3–35 cm high and 1–3 mm thick, solitary or several, erect or ascending, reddish, leafy, branched in inflorescence, pubescent with short, upwardly strigose hairs, sometimes mixed with long, spreading, multicellular hairs. Leaves green, ciliate or with sparse, spreading, multicellular hairs on both sides; basal leaves oblanceolate, acute, long-petiolate, entire or with scattered fine teeth, 1.5–8.0 cm long and 2–8 mm wide; cauline leaves 0.6–9.0 cm long and 0.5–9.0 mm wide, lower leaves like basal, upper lanceolate, acute, sessile, entire. Inflorescence corymbose-raceme; capitula not numerous, 0.8–1.0 cm long and 1.5–1.7 cm wide. Involucral bracts shorter than disk, reddish, linearly lanceolate, acute, with stalked, capitate glands and scattered, spreading, stiff, multicellular, long hairs, inner bracts 5.0–6.7 mm long and 0.6–0.9 mm wide, outer almost half as long. Peripheral florets pistillate, of two types: outer ligulate, 5.7–7.6 mm long (of which tube 3–4 mm), pubescent in upper part of tube with fine appressed hairs, ligules pink, not lobed, about 0.3 mm wide; middle tubular, 3.2–3.6 mm long, pubescent in upper half with fine appressed hairs, style longer than tube by 1.2–1.4 mm; disk florets 4.8–5.5 mm long, bisexual, tubular, five-toothed, yellow with pink teeth, sparsely pubescent in upper part of tube with appressed hairs. Pappus two-rowed, outer bristles very short, inner 4.5–5.8 mm long; achenes oblong-lanceolate, compressed, 1.7–2.4 mm long, pubescent with sparse, semi-appressed hairs. Flowering VII–IX.

Mountains, glacial moraines, alluvial deposits, gravel beds, subalpine meadows, at 2,000–2,600 m. —*Caucasus*: Ciscaucasia, Dagestan, eastern Transcaucasia, southern Transcaucasia. Endemic. Described from the Shaurtu (Tekhtengi) glacier in the upper reaches of the Chegem River. Type in Leningrad.

55. **E. schmalhausenii** M. Pop. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, VIII (1940) 51; Popov in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, No. 7, 11; Krylov, Fl. Zap. Sib. XI, 2688. —*E. eriocephalus* Rgl. 265 and Schmalh. in Tr. Peterb. Bot. Sada, V (1878) 613, non J. Vahl. (1840); O. and B. Fedtsch. Perech. Rast. Turk. IV, 166. —*Trimorpha eriocephala* Novopokr. ex Serg. in Krylov, Fl. Zapadnoi Sibiri XI (1949) 2689, in syn.

Perennial. Rhizome branched; stems usually several, 10–45 cm high and 1–3 mm thick, ascending, sometimes erect or flexuous, particularly above, brownish-reddish, very rarely green, leafy, branched, densely appressed-hairy, sometimes with sparse, long, spreading, stiff, multicellular hairs, particularly below capitula. Leaves coriaceous, green or reddish, entire, entirely glabrous or usually ciliate with long multicellular or short hairs, but glabrous on both sides; basal leaves linear or narrow linearly lanceolate, obtuse or acute, long-petiolate, 1.5–9.0 cm long and 1–8 mm wide; cauline leaves sessile, linear or narrow linearly lanceolate, acute, 0.3–9.0 cm long and 0.3–8.0 mm wide. Capitula in corymbose racemose inflorescence, usually numerous, 7–12 mm long and 1.4–2.5 cm wide. Involucral bracts linearly lanceolate, acute, reddish, very rarely green, densely (sometimes sparsely) covered with very long, spreading stiff, multicellular hairs; inner bracts shorter than disk, 6–9 mm long and 0.6–1.1 mm wide, outer almost half as long. Peripheral florets in upper part of tube pubescent with sparse, appressed hairs, pistillate of two types: outer ligulate, 5.2–9.5 mm long (of which tube 2.8–5.0 mm), ligules pink or lilac, about 0.5 mm wide; middle tubular with colorless tube 2.0–4.6 mm long, style pink or lilac, longer than tube by 1 3–2.2 mm; disk florets bisexual, tubular, five-toothed, 4.5–5.9 mm long, pubescent almost throughout tube with sparse, appressed hairs, lobes pink or lilac. Pappus double, outer bristles very short, inner 5.0–6.7 mm long; achenes oblong-lanceolate, compressed, 2.3–3.3 mm long, densely covered with more or less long semi-appressed hairs. Flowering VI–IX.

Mountains, glacial moraines, and gravel-beds, at 1,200–2,700 m. —*Western Siberia*: Altai; *Soviet Central Asia*: Dzhungaria-Tarbagatai, Pamiro-Alai (Alai Range, Pamir), Tien Shan. *General distribution*: Dzhungaria-Kashgaria. Described from the Issykkul Lake. Type in Leningrad.

Note. Three plants are mentioned in the description of *E. eriocephalus* Rgl. and Schmalh. I recommend the first of them as the lectotype of the species: "Tüb an Yssykkul Semenov" which is preserved in the herbarium of the Botanical Institute of the Academy of Sciences of the USSR in Leningrad.

The species was renamed by M.G. Popov as *E. schmalhausenii* M. Pop. because its prior name was a later homonym.

E. schmalhausenii M. Pop. is very close to *E. pseuderiocephalus* M. Pop. (cf. the note under the latter).

266 *Section* 3. LONGISQUAMATAE Botsch. —Ligules considerably longer than disk; pappus two times as long as achenes; involucre longer than disk. Biennials.

56. **E. sachalinensis** Botsch. nom. nov. —*E. kamtschaticus* DC. var. *hirsuta* Fr. Schmidt in Mém. Acad. Sc. St.-Pétersb., sér. VII, t. XII, No. 2 (1864) 147, non *E. hirsutus* Lour. (1793). —*E. acer* auct., non L. (1753); Kitamura in Mem. Coll. Sc. Kyoto Imp. Univ., ser. B. XIII (1937) 324.

Biennial. Stems solitary or several, green or reddish, erect, leafy, branched in inflorescence, sparsely covered with long, spreading, multicellular and numerous short, upwardly strigose hairs, very rarely glabrous, 8–55 cm high and 1–3 mm thick. Leaves soft, green, sparsely covered with long, spreading multicellular hairs, very rarely glabrous; basal leaves 2–16 cm long and 4–24 mm wide, oblanceolate, acute, long-petiolate, remotely sharply toothed; cauline leaves 0.5–13.0 cm long and 0.5–23.0 mm wide, lower leaves like basal, middle lanceolate, acute, sessile, sparsely finely and sharply toothed, upper leaves lanceolate or linearly lanceolate, acute, sessile, entire. Inflorescence racemose; capitula less numerous 0.8–1.0 cm long and 1.4–2.0 cm wide. Involucral bracts linearly lanceolate, acuminate, green, sparsely covered with long, erect, multicellular hairs, very rarely glabrous; inner bracts longer than disk, 7–9 mm long, 0.6–0.9 mm wide, outer half as long as inner ones. Peripheral florets with occasional, very short, appressed hairs in upper part of tube, pistillate, of two types: outer ligulate, 5.7–8.0 mm long (of which tube 2.2–3.2 mm), ligule lilac, about 0.3 mm wide; middle tubular, with colorless, 1.5–2.9 mm long tube, style longer than tube by 1.2–1.6 mm. Disk florets bisexual, tubular, five-toothed, yellow or with lilac teeth, 3.3–5.0 mm long, pubescent with sparse, appressed hairs in upper part of tube. Pappus two-rowed, outer bristles very short, inner 4.0–4.7 mm long; achenes oblong-lanceolate, compressed, 2.1–2.7 mm long, pubescent with semi-appressed hairs. Flowering VII–IX.

In thickets of Siberian dwarf pine and on rocks. —*Far East*: Sakhalin (and Kuril Islands). *General distribution*: Japan. Described from Sakhalin Island. Type in Leningrad.

Subgenus III. **CONYZASTRUM** (Boiss.) M. Pop. in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, 7 (1948) 11. —Florets homochromous, usually yellow, but turning purple after flowering, less often permanently purple, pink, straw-colored or colorless, of two types: peripheral florets pistillate, or very rarely tubular; disk florets bisexual, tubular with pubescent teeth. Achenes usually more or less as long as pappus, 267 very rarely half as long, usually developing only in pistillate florets, but sometimes in all florets. Semishrubs, less often perennial, biennial, or annual herbs.

Section 1. PSYCHROGETON (Boiss. pr. gen.) Botsch. h. 1. —Perennials with developed caudex. Stem usually one-headed, less often weakly branched.

Series 1. Pseuderigeron M. Pop. in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, 7 (1948) 9 (pr. sect.). —Hairs simple, rough, erect, not tomentose. Ligules pink, recurved, after flowering revolute. Leaves obovate or oblanceolate. Peduncles branched or simple.

57. **E. pseuderigeron** (Bge.) M. Pop. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, VII (1937) 132; ibid., VIII (1940) 49 in observ.; Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, 7, 9; Botschantsev in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR XVI, 380. —*Heterochaeta pseuderigeron* Bge. Reliq. Lehman (1851) 150. —*Erigeron lehmanni* Boiss. Fl. or. III (1875) 171; O. and B. Fedtsch. Perech. Rast. Turk. IV, 166. —*Aster capusi* Franch. in Ann. Sc. Nat., sér. 6, XVI (1883) 304. —*Diplopappus capusi* Franch. ibid. —*D. capusi* O. and B. Fedtsch. Perech. Rast. Turk. IV (1911) 162.—*Psychrogeton capusi* Novopokr. ex Krasch. in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, 3 (1937) 343 in adnot., p. p. quoad nomen. —*P. pseuderigeron* Novopokr. ex Nevski in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, 4 (1937) 278. —*Erigeron capusi* Novopokr. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR VII (1937) 131, p. p. quoad nomen. —*E. pseuderigeron* (Bge.) M. Pop. ssp. *serratifolius* Novopokr. ibid., p. 133. —*E. pseuderigeron* (Bge.) M. Pop. ssp. *erectus* Novopokr. ibid., p. 133. —*E. pseuderigeron* (Bge.) M. Pop. var. *oligocephalus* Novopokr. ibid., p. 134.

Perennial. Caudex woody, branched, many-headed with numerous peduncles and sterile rosettes of leaves. Stems, leaves and involucral bracts densely covered with rather long, simple, multicellular, spread-

ing, stiff hairs and more or less sessile capitate glands which are more in upper parts of plant, but inner involucral bracts usually covered only with glands. Stems slender, 1–3 mm thick, 3 to 50 cm high, erect, or ascending, leafy, once or twice branched, very rarely simple. Basal leaves green, broadly oblanceolate, acute or very rarely obovately-oblong, rather coarsely and closely sharp serrate-toothed, less often almost entire, long petiolate (petiole almost equaling lamina), 1.5–15.0 cm long and 0.5–3.2 cm wide; lower cauline leaves similar but with much shorter petiole; higher leaves sessile, semiamplexicaul, much smaller, toothed or entire; highest leaves sessile, entire, linear or lan-
268 ceolate, very small. Inflorescence corymbose. Capitula few, 0.8–1.3 cm long and 1–2 cm wide. Involucral bracts linearly lanceolate, very long acuminate, membranous along margin, apically red, as long as pappus. Ray florets pistillate, longer than pappus, pink, 7.5–8.0 mm long; ligules 2.5–3.0 mm long and 0.5–1.0 mm wide, flat, recurved, linear, slightly narrowed toward tip and with three small, obtuse teeth at apex, revolute after flowering; tube almost entirely covered with rather dense, semi-appressed, short hairs; disk florets bisexual, tubular, five-toothed, as long as pappus, rather densely pubescent throughout with semi-appressed hairs (only tubes below teeth narrow at base and not pubescent above middle). Pappus two-rowed, outer bristles short, inner about 5.5 mm long; achenes developing in all florets, oblanceolate, compressed, about 2.5 mm long and 0.6 mm wide, rather densely covered with somewhat long, stiff, semi-appressed hairs and sessile glands. Flowering VI–IX.

On sandy and stony slopes, in crevices of rocks, in middle and upper mountain zones at 1,800–3,500 m. —*Soviet Central Asia*: Pamiro-Alai, Tien Shan (west), mountainous Turkmenia. *General distribution*: Iran Region. Described from Upper Zeravshan. Type in Leningrad.

Note. The names *Psychrogeton capusi* Novopokr. and *Erigeron capus* Novopokr. were published because Novopokrovski erroneously interpreted *Aster capusi* Franch., identifying it with *Erigeron rupestris* M. Pop. (=*Aster popovii* Botsch.). In fact, *Aster capusi* Franch. undoubtedly is a synonym of *Erigeron pseuderigeron* (Bge.) M. Pop. This became abundantly clear when we examined the type of *Aster capusi* Franch. (cf. Botschantzev in *Bot. Mat. Gerb. Bot. Inst. Akad. Nauk. SSSR* XVI, 1954, 379–381).

58. **E. primuloides** M. Pop. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR VIII (1940) 49; Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, 7, 9; Novopokr. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR VII (1937) 132, nomen. —*Diplopappus turkestanicus* Rgl. and Schmalh. var. *serratifolius* Winkl. ex O. and B. Fedtsch. Perech. Rast. Turk. IV (1911) 162, p. p. quoad pl. seravschanicam.

Perennial. Caudex woody branched many-headed; stem erect, usually ascending, 4–18 cm high and 1 mm thick, single-headed, leafy, like leaves and involucral bracts covered with short, stiff, spreading hairs and short-stalked, capitate glands. Leaves grayish-green; basal leaves 1.0–6.5 cm long 0.5–2.7 cm wide, obtuse, petiolate, sparsely serrate in upper half, obovate, less often ovate or oblong-ovate; cauline leaves four to six, sessile, 0.5–2.5 cm long and 1–8 mm wide, lower leaves oblong-obovate, obtuse, apically toothed, upper lanceolate, entire, acute. Capitulum 1.2–1.4 cm long and 1.8–2.2 cm wide. Involucral bracts 269 linearly lanceolate, scarious along margin; inner bracts 7–9 mm long and about 1 mm wide. Ray florets pistillate, much longer than pappus, pink, 7.0–8.5 mm long, throughout tube sparsely pubescent; ligules oblong, obtuse, recurved, 3.0–4.25 mm long and 0.5–1.0 mm wide, with two or three small, obtuse teeth at apex, after flowering becoming revolute; disk florets bisexual, tubular, five-toothed, pink, 5–6 mm long, sparsely pubescent in middle of tube and on teeth. Pappus two-rowed, inner bristles 45–55, 5.5–6.0 mm long, outer short, few; achenes developing only in pistillate florets, oblanceolate, compressed, 4.5–5.0 mm long, densely covered with long, semi-appressed, stiff hairs and scattered sessile glands. Flowering V–VII.

Rocks, at 2,000–3,000 m. —*Soviet Central Asia*: Pamiro-Alai. Endemic. Described from the Chulbair Mountains (a spur of the Gissar Range). Type in Tashkent.

Note. Closer to the Iranian *E. latisquamus* Boiss. and *E. obovatus* (Benth.) Boiss. From both of these species it is distinguished by longer ligules, short hairs on the plant, long hairs of the achenes and gradually acuminate involucral bracts.

Series 2. Orthoglossae Botsch. h. 1. —Hairs simple, thin or thick, flexuous, tomentose; sometimes simple hairs absent and only stalked capitate glands present. Ligules straight or slightly recurved, usually purple, relatively narrow, with short or long teeth. Leaves obovate or lanceolate. Peduncles usually not branched.

59. **E. brachyspermus** Botsch. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR XVIII (1957) 266. —*Psychrogeton chionophilum* Krasch in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, 3 (1937) 343 in adnot., p. p. quoad plantam, non *Erigeron chionophilum* Boiss.

Perennial. Caudex woody, branched, many-headed, covered with remains of old leaves. Stems single-headed, 6–11 cm high and 1 mm thick, erect or ascending, leafy, like leaves and involucral bracts densely covered with short-stalked, capitate glands, sometimes mixed with scattered, multicellular, somewhat long hairs. Leaves green; basal leaves

3.0–4.5 cm long and 7–8 mm wide, linearly lobate or oblanceolate, petiolate, sparsely serrate in upper half; cauline leaves three to five, sessile, linearly oblong, 0.5–1.5 cm long and 1–2 mm wide. Capitulum about 1.8 cm wide and 0.9 cm long. Involucral bracts linearly lanceolate, gradually acuminate, green, reddish in upper part; inner bracts (longest) about 7 mm long and 1 mm wide. Ray florets pistillate, 4.5–5.0 mm long, basally green, apically purple, sparsely pubescent in middle
270 with appressed hairs; tubular florets with three small obtuse glabrous teeth in upper part or with very small (almost one-fourth as long as tube), narrow (0.25 mm wide), spatulate, glabrous ligule not recurved and not longer than pappus, and with two or three small obtuse teeth at apex; disk florets bisexual, tubular, five-toothed, 4.5–5.0 mm long, in middle part of tube and on lobes with scattered, short, appressed hairs, basally green, purple above. Pappus two-rowed, almost all of 45–50 bristles long, 4.7–5.5 mm; achenes developing in all florets, yellowish, oblanceolate, flattened, 2.8–3.3 mm long, covered with short appressed hairs not contiguous, and with few sessile glands. Flowering VII–IX.

Rocks and stony slopes of upper mountain zone at 4,150–4,700 m. —*Soviet Central Asia*: Pamiro-Alai (Pamir). Endemic. Described from the region of the Aktash Mountains in the eastern Pamir. Type in Leningrad.

60. **E. olgae** Rgl. and Schmalh. in Izv. Obshch. Lyub. Est. Antrop. i Etnoger. XXXIV, 2 (1882) 44; O. and B. Fedtsch. Perech. Rast. Turk. IV, 166; Popov in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, 7, 9. —*Psychrogeton olgae* Novopokr. ex Nevski in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, 4 (1937) 278. p. p. quoad nomen; Novopokr. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR VII, 136.

Perennial. Caudex woody, branched, many-headed. Stems erect or usually ascending, 5–15 cm high and about 1 mm thick, single-headed, leafy, like leaves and involucral bracts densely covered with thick, long, multicellular, intertwined hairs. Leaves grayish-green; basal leaves petiolate, 1.0–5.5 cm long and 0.5–2.0 cm wide, obovate with round apex, sparsely serrate in upper half, sometimes in lower half boldly crenately lobed, less often lamina entire; cauline leaves three to six, 0.7–3.3 cm long and 1–5 mm wide; lower leaves oblong-obovate, obtuse, entire, sessile or very rarely petiolate; upper lanceolate, acute sessile. Capitulum 2–3 cm wide and 1.0–1.5 cm long. Involucral bracts lanceolate, gradually acuminate, scarious along margin; inner bracts 6.0–8.5 mm long and 1.0–1.5 mm wide, outer somewhat shorter and narrower. Ray florets pistillate, as long as or slightly longer than pappus, purple, 6–7 mm long, sparsely pubescent in middle part of tube; ligules oblong, obtuse, with two or three small, acute teeth at apex or with two or three large teeth, sometimes lanceolate, acute, without teeth, about 2.5 mm long and 0.5 mm wide, straight, after flowering not changing or becoming revolute; disk florets bisexual, tubular, five-toothed, purple, 5.5–6.0 mm long, in middle part of tube sparsely pubescent, but on teeth with 271 few, long, fragile hairs. Pappus two-rowed, bristles 70–80, almost all long, 6.0–6.5 mm; achenes developing only in pistillate florets, oblanceolate, compressed, olive or reddish-olive colored, 4.25–4.75 mm long, covered with very long, not contiguous, thin appressed scattered hairs. Flowering VII–IX.

Crevices of rocks, talus, on moraines, sandy-stony slopes, at 3,000–4,700 m. —*Soviet Central Asia*: Dzhungaria-Tarbagatai, Pamiro-Alai, Tien Shan. Endemic. Described from Soviet Central Asia (Alai Range, Dzhintyk Pass). Type in Leningrad.

61. **E. alexeenkoi** Krasch. in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, 3 (1937) 343; Botschantzev in Bot. Zhurn. XLII, No. 5, 774. —*Psychrogeton alexeenkoi* H. Krasch. ibid. —*Erigeron dichrous* M. Pop. in Tr. Uzbek. Gos. Univ. Nov. Ser. 27, Biol. No. 14 (1941) 68, nom. subnud., p. p. excl. syn. —*E. polyadenus* Rech. f. and Köie in Dan. Biol. Ser. 8, No. 2 (Symbolae Afghanicae II) (1955) 15, fig. 7 and 8e.

Perennial. Caudex woody, branched, many-headed; stem erect or ascending, 6–18 cm high and 1.0–1.5 mm thick, usually solitary, but often two- to five-headed, leafy, like leaves and involucral bracts covered with short-stalked, capitate glands, sometimes mixed with loose tomentum—var. *mollissimus* m. (=*E. mollissimus* Rech. f. and Köie). Leaves green; basal leaves 2–9 cm long and 0.6–2.5 cm wide, obovate or obovate-oblong, obtuse, in upper half coarsely and sparsely serrate, long-petiolate; cauline leaves two to five, lower oblanceolate, obtuse, entire, petiolate, more or less 3.5 cm long and 0.7 cm broad, gradually reduced upwards and upper leaves 0.5 cm long and 1 mm wide, becoming linear, sessile, and acute. Capitulum up to 1.3 cm long and 2.4 cm wide. Involucral bracts linearly lanceolate, gradually acuminate, green, apically reddish, membranous along margin; inner bracts about 9 mm long and 1.5 mm wide, outer slightly shorter and narrower. Ray florets pistillate, as long as pappus or slightly longer than pappus, purple, about 6–7 mm long, tube sparsely pubescent in middle; ligules as long as tube or slightly longer, narrow (about 0.5 mm wide), acuminate or with two or three, rather large, acute teeth, straight, after flowering not changing or becoming revolute, sometimes ligules almost aborted and represented by small, narrow and acute teeth; disk florets bisexual, tubular, five-toothed, purple, about 5.5 mm long, sparsely pubescent in middle of tube and on lobes. Pappus two-rowed, bristles 50–70, almost all long, about 6 mm; achenes developing only in pistillate florets, oblanceolate, 272 flat, about 5.5 mm long, covered with sessile glands and rather long, semi-appressed, stiff hairs not forming a crown at base of pappus. Flowering VI–VIII.

Rocky slopes in upper mountain zone, at 3,000–3,600 m. —*Soviet Central Asia*: Pamiro-Alai (Alai, Upper Zeravshan, western Pamir). *General distribution*: Iran Region (Afghanistan). Described from Soviet Central Asia (western Pamir, the village of Lyangar-gisht on the Pamir River). Type in Leningrad.

62. **E. karatavicus** Pavl. in Vestn. Akad. Nauk Kaz. SSR 52 (1949) 49. —*E. nigromontanus* M. Pop. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR VIII (1940) 55, non Boiss. and Buhse (1860); in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, 7, 9.

Perennial. Caudex woody, branched, many-headed. Stems leafy, single-headed, 3–12 cm high, like leaves and involucral bracts covered with numerous stalked, capitate glands. Leaves green; basal leaves oblanceolate, acute, petiolate, with scattered, sharp, fine teeth in upper half, 2.5–7.5 cm long and about 1 cm wide, cauline leaves three or four, acuminate, entire, 0.5–2.0 cm long and 0.5–2.5 mm wide, lower leaves lanceolate, short-petiolate, upper linear, sessile. Capitulum about 1 cm long and 1.8 cm wide. Involucral bracts linearly lanceolate, acuminate, green, scabrous along margin; inner bracts about 6 mm long and 1 mm wide, outer somewhat short and narrower. Ray florets pistillate, purple, 4.0–4.5 mm long, pubescent throughout with appressed hairs; ligules about 1 mm long, straight, obtuse, three-toothed, teeth fine, round; disk florets bisexual, tubular, five-toothed, purple, about 4.5 mm long, in middle part and on lobes covered with short appressed hairs. Pappus two-rowed, inner bristles 4.0–4.5 mm long, 30–40, outer short, solitary; achenes developing only in pistillate florets, oblanceolate, compressed, about 4.5 mm long, covered with sessile glands and rather long, somewhat stiff, semi-appressed hairs. Flowering VI–VII.

Stony-gravelly slopes. —*Soviet Central Asia*: Tien Shan (Karatau Mountains). Endemic. Described from the Myn-Dzhilke Peak in the Karatau Mountains. Type in Tashkent; isotype in Leningrad.

Note. If *E. karatavicus* Pavl. were not found only on Mt. Myn-Dzhilke in the Karatau, then it could have been treated as a variety, lacking the simple hairs, of the widely distributed *E. leucophyllus* (Bge.) Boiss. But its well separated range compels me consider *E. karatavicus* Pavl. as a geographic race and, in conformity with the tradition in the *Flora of the USSR*, to retain its binomial name.

63. **E. leucophyllus** (Bge.) Boiss. Fl. or. III (1875) 171; O. and B. Fedtsch. Perech. Rast. Turk. IV, 166; Popov in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, 7, 9, p. p. excl. syn. *Aster poncinsii* Franch.; 273 Botschantzev in Bot. Zhurn. XLII, 5, 774. —*Heterochaeta leucophylla* Bge. Reliq. Lehman. (1851) 149. —*Psychrogeton leucophyllus* Novopokr. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR VII (1937) 136. —*Erigeron leucophyllus* M. Pop. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR VIII (1940) 49 in adnot. —*E. candidissimus* Rech. f. and Edelberg in Dan. Biol. Ser. 8, No. 2 (Symbolae Afghanicae II) (1955) 13, fig. 5 and 8c.

Perennial. Caudex woody, branched, many-headed; stem erect or ascending, 2–15 cm high and 0.75–1.5 mm thick, single-headed, leafy, like leaves and involucral bracts tomentose, sometimes simple hairs sparse and then mixed with stalked, capitate glands. Leaves grayish-green; basal leaves petiolate, 1–9 cm long (of which petiole 0.3–0.5 cm) and 0.4–2.5 cm wide, obovate, more rarely oval-oblong, and sparsely, sharply, coarsely toothed, but more rarely entire, usually obtuse but less often acute; cauline leaves two to four, 0.3–2.5 cm long and 0.5–5.0 mm wide, entire, lower obovate or lanceolate, short-petiolate, upper linear, acute, sessile. Capitulum 1.3–2.2 cm wide and 0.7–1.1 cm long. Involucral bracts linearly lanceolate, gradually acuminate, grayish-green, apically sometimes reddish, scarious along margin, 5.5–8.0 mm long and 0.7–1.5 mm wide; outer bracts somewhat shorter and narrower than inner. Ray florets pistillate, purple, more or less equaling pappus, 3.5–5.5 mm long, entire tube and sometimes also entire ligule pubescent; ligules straight or slightly recurved, 1.0–2.2 mm long and 0.5–0.7 mm wide, obovate or spatulate, with three small subobtuse teeth at apex, very rarely ligules almost aborted; disk florets bisexual, tubular, five-toothed, purple, 3.7–5.0 mm long, pubescent in middle part of tube, but on lobes usually with long, scattered hairs. Pappus two-rowed, longer bristles 20–70, 3.5–5.5 mm long, outer bristles few, short; achenes developing only in pistillate florets, oblanceolate, compressed, 3.2–4.6 mm long, covered with rather long, semi-appressed hairs forming corona at base of pappus. Flowering V–VIII.

Crevices of rocks and stony slopes, at 1,500–3,000 m. —*Soviet Central Asia*: Pamiro-Alai, Tien Shan (western). *General distribution*: Iran Region (Afghanistan). Described from Soviet Central Asia (Upper Zeravshan). Type in Paris.

Note. E. leucophyllus (Bge.) Boiss. is a widely distributed and rather polymorphic species. This polymorphism is mainly evident in that its leaves vary from oval-oblong and entire or coarsely and sharply toothed to obovate and entire or coarsely and sharply toothed; moreover, the plants with leaves of various forms are found together at the same place in the range. The pubescence of this species, as well as the number of pappus hairs, also varies greatly.

274 *Series* 3. Andryaloides (DC.) M. Pop. in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, 7 (1948) 9. —Hairs simple, fine, flexuous, tomentose, sometimes absent. Ligules recurved, golden-yellow or yellow, after flowering turning purple, rather wide with short teeth at apex. Leaves obovate or lanceolate. Stems simple.

64. **E. andryaloides** (DC.) Benth. in Clarke Comp. Ind. (1876) 52; Hook. Fl. Brit. Ind. III, 225, p. p. excl. pl. tibeticae; Boiss. Fl. or. Suppl., 288, p. p. quo ad nomen. —*Conyza andryaloides* DC. Prodr. V (1836) 377. —*Diplopappus andryaloides* O. and B. Fedtsch. in Perech. Rast. Turk. IV (1911) 162, p. p. excl. syn. *Aster poncinsii* Franch. —*Aster andryaloides* B. Fedtsch. Rast. Turkest. (1915) 730, p. p. excl. syn. —*Aster poncinsii* Franch. —*Psychrogeton andryaloides* Novopokr. ex Krasch. in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, No. 3 (1937) 343 in adnot., p. p. excl. syn. *Aster poncinsii* Franch.; Novopokr. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, VII, 136.

Perennial. Caudex woody, branched, many-headed. Stems erect or ascending 2–10 cm high and about 1 mm thick, one-headed, leafy, like leaves and involucral bracts tomentose, sometimes mixed, mainly on involucral bracts, short-stalked, capitate glands, less often only with stalked, capitate glands, (var. *glandulosus* m.). Leaves grayish-green; basal leaves obovate, obtuse, petiolate, sparsely and coarsely serrate-crenate or entire, 1–7 cm long (of which petiole 0.2–2.5 cm) and 0.4–2.5 cm wide; cauline leaves two to four, 0.5–2.0 mm long and 0.5–7.0 mm wide, entire, lower leaves obovate, obtuse, short-petiolate, upper ones linear, cuspidate, sessile. Capitulum 1.6–2.0 cm wide and 0.9–1.2 cm long. Involucral bracts linearly lanceolate, gradually acuminate, grayish-green, at apex sometimes reddish, membranous along margin and fimbriate; inner bracts 5.5–8.0 mm long and 1.0–1.2 mm wide, outer shorter and narrower. Ray florets pistillate, pale yellow, after flowering becoming reddish, somewhat longer than pappus, 5–6 mm long, throughout tube and sometimes ligule also pubescent; ligules recurved, 1.5–2.5 mm long and 1.0–1.5 mm wide, obovate, with three small obtuse teeth at apex; disk florets bisexual, tubular, five-toothed, pale yellow, after flowering becoming reddish, 4.6–5.4 mm long, sparsely pubescent in middle of tube and on lobes. Pappus two-rowed; longer bristles 23–27, 4.0–5.2 mm long, outer bristles short, few; achenes developing only in pistillate florets, oblanceolate, compressed, 3.5–5.0 mm long, covered with rather long, somewhat stiff, semi-appressed hairs forming corona at base of pappus. Flowering V–VII.

275 Rocks and stony slopes, at 2,500 m. —*Soviet Central Asia*: Pamiro-Alai (western Pamir and eastern part of southern Tadzhikistan). *General distribution*: Indo-Himalayas, Iran Region (Afghanistan). Described from northwestern India. Type in Geneva; isotype in Leningrad.

Note. Hooker (l. c.) considered *E. andryaloides* (DC.) Benth. as a widely distributed species, and such an interpretation of the species was considered correct until now.

However, examination of the copious herbarium material made it possible, firstly, to restore *E. poncinsii* (Franch.) Botsch. and, secondly, to segregate *E. leucophyllus* (Bge.) Boiss. and thus significantly narrow the circumscription of *E. andryaloides* (DC.) Benth. and very greatly reduce its range.

Now it is absolutely clear that *E. andryaloides* (DC.) Benth., characterized by recurved pale yellow ligules becoming reddish only after flowering, ligules shorter than tube, and obovate leaves with round teeth, is found only in northwestern India, western Pamir, southern Tadzhikistan and Afghanistan.

E. leucophyllus (Bge.) Boiss., now known only from the USSR (Pamiro-Alai, excluding the Pamir, western Tien Shan, in the east up to the western terminal spurs of the Kirgiz Alatau) and from Afghanistan, is distinguished from the former species by straight or slightly recurved, purple ligules much shorter than the tube and obovate, more rarely oval leaves, mostly with cuneate teeth.

E. poncinsii (Franch.) m. was found to be the most widely distributed species. Its range stretches from Afghanistan through India, Pamir, and Kashgaria up to Tibet. The main distinguishing features of this species are: recurved, golden-yellow ligules, longer than the tube that becomes purple after flowering, and lanceolate leaves.

These three as well as some other species of the subgenus *Conyzastrum* (Boiss.) M. Pop. have an interesting peculiarity: along with pubescent plants, in the populations of these species in all areas of their range we find plants without the simple hairs and only with stalked, capitate glands.

65. **E. poncinsii** (Franch.) Botsch. in Bot. Zhurn. XLII, 5 (1957) 776. —*Aster poncinsii* Franch. in Bull. Mus. Hist. Nat. II, 7 (1896) 345. —*Erigeron andryaloides* (DC.) Benth. ex Hook. Fl. Brit. Ind. III (1881) 255, p. p. quoad pl. tibeticam; Boiss. Fl. or., Suppl. 288, p. p. quoad plantam. —*Diplopappus andryaloides* O. and B. Fedtsch. Perech. Rast. Turk. IV (1911) 163, p. p. quoad syn. *Aster poncinsii* Franch. —*Aster andryaloides* B. Fedtsch. Rast. Turkest. (1915) 730, p. p. quoad syn. *A. poncinsii* Franch. —*Psychrogeton andryaloides* Novopokr. ex Krasch. in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, 3 (1937) 343 in ad not.,

p. p. quoad syn. *Aster poncinsii* Franch. —*P. chionophilus* Krasch. in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, 3 (1937) 343 in adnot., p. p., non *Erigeron chionophilum* Boiss. —*Erigeron minjanensis* Rech. f. in
276 Dan. Biol. Ser. 8, 2 (Symbolae Afghanicae) II (1955) 20, fig. 11 and 15c. —*E. sanglichensis* Rech. f. and Edelberg, ibid., 20 fig. 12 and 15d. —*E. paghmanicus* Rech. f. ibid., 22, fig. 13. —*E. leucophyllus* auct., non Boiss.: Popov in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, 7 (1948) 8, p. p. quoad syn. *Aster poncinsii* Franch.

Perennial. Caudex woody, branched, many-headed. Stems erect or usually ascending, 3–19 cm high and 1.0–1.5 mm thick, single-headed, very rarely producing single branch with one more capitulum, leafy, covered like leaves and involucral bracts with dense or loose tomentum of fine flexuous hairs, sometimes mixed with stalked, capitate glands, less often absolutely lacking simple hairs but with only sparse, stalked, capitate glands (var. *denudatus* m.). Leaves grayish-green, or very rarely green (depending on the nature of pubescence): basal leaves petiolate, oblanceolate, and cuspidate, very rarely obovate-lanceolate, obtuse, sharply serrate and somewhat repand, less often entire and not repand, 1–6 cm long and 0.3–1.0 cm wide; cauline leaves three to five(eight), 0.5–2.0 cm long and 1–3 mm wide, lower leaves short-petiolate, oblanceolate, upper ones sessile, linear. Capitulum 0.9–1.4 cm long and 1.6–2.4 cm wide. Involucral bracts linearly lanceolate, gradually acuminate, grayish-green or green (depending on the nature of pubescence), scarious along margin; inner bracts 6.5–8.0 mm long and about 1 mm wide, slightly shorter than pappus. Ray florets pistillate, exceeding pappus, golden yellow, after flowering becoming purple, 5–6 mm long, in middle of tube sparsely pubescent; ligules recurved, 2.5–3.5 mm long and 0.8–2.0 mm wide, obovate, with three obtuse, or less often acute, teeth at apex; disk florets bisexual, tubular, five-toothed, golden-yellow, after flowering becoming purple, 3.5–5.0 mm long, in middle part of tube and on lobes sparsely pubescent. Pappus two-rowed, inner bristles 30–33, 3.5–4.5 mm long, outer few, very short; achenes developing only in pistillate florets, oblanceolate, compressed, 3.5–4.5 mm long, covered with sessile glands and semi-appressed, somewhat stiff hairs not forming corona at base of pappus. Flowering VI–VIII.

On rocks, stony or sandy-gravelly slopes at 2,500–4,200 m. —*Soviet Central Asia*: Pamiro-Alai (Pamir). *General distribution*: Iran Region (Afghanistan), Indo-Himalayas, Dzhungaria-Kashgaria, Tibet. Described from Afghanistan (upper reaches of the Vakhan-darya River). Type in Paris.

Series 4. Eupsychrogeton M. Pop. in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, 7 (1948) 8. —Hairs spreading, multicellular, not tomen-
277 tose. Ligules recurved, rather broad, golden-yellow or yellow, after flowering usually becoming purple, with short teeth at apex. Leaves lanceolate. Stems usually branched.

66. **E. cabulicus** (Boiss.) Botsch. in Bot. Zhurn. XLII, 5 (1957) 775. —*Psychrogeton cabulicum* Boiss. Fl. or. III (1875) 156; Novopokr. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR VII (1937) 135. —*Diplopappus turkestanicus* Rgl. and Schmalh. in Tr. Peterb. Bot. Sada V, 2 (1878) 615; O. and B. Fedtsch. Perech. Rast. Turk. IV (1911) 162. —*Aster turkestanicus* Franch. in Ann. Sc. Nat., sér. 6, XVI (1883) 303. —*Erigeron turkestanicus* O. Fedtsch. in Tr. Peterb. Bot. Sada XXI (1903) 341. —*Psychrogeton turkestanicus* Hoffm. in Vidensk. Meddel. fra den naturh. Foren i Kbhvn (1903) 145. —*Erigeron psychrogeton* M. Pop. ex Novopokr. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR VII (1937) 136 sub syn.; Popov in Tr. Uzbeksk. Gos. Univ., Nov. Ser. 27, Biol., No. 14 (1941) 67; nomen; Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, No. 7 (1948) 8. —*E. dichrous* M. Pop. in Tr. Uzbeksk. Gos. Univ., Nov. Ser. 27, Biol., No. 14 (1941) 68, p. p. quoad syn. —*E. turkestanicus* Hoffm. ex M. Pop. in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, No. 7 (1948) 8, sub. syn. —*E. edelbergii* Rech. f. and Köie in Dan. Biol. Ser. 8, 2 (Symbolae Afghanicae, II) (1955) 18, fig. 9 and 15a. —*E. koelzianus* Rech. f. in Dan. Biol. Ser. 8, 2 (Symbolae Afghanicae, II) (1955) 18, fig. 10 and 15b.

Perennial. Caudex woody, branched, many-headed. Stems erect or usually ascending, 1–30 cm high and 0.5–3.0 mm thick, simple, single-headed or branched only once, with two to four capitula, leafy, like leaves and involucral bracts covered with short, stiff, multicellular, spreading hairs (sometimes hairs longer and softer) and short-stalked, capitate glands, which sometimes predominate. Leaves green; basal leaves lanceolate or linearly lanceolate, long acuminate, long-petiolate, entire, or very rarely with occasional, acute teeth, 1.0–12.5 cm long and 1.0–1.6 mm wide, cauline leaves lanceolate or linearly lanceolate, entire, upper leaves sessile, lower short-petiolate, 0.3–8.0 cm long and 0.5–14.0 mm wide. Capitula 0.6–1.4 cm long and 1.0–2.6 cm wide. Involucral bracts linearly lanceolate, 5–8 mm long and 0.8–1.5 mm wide, scarious along margin and fimbriate, particularly at apex. Ray florets pistillate, golden-yellow, after flowering usually becoming reddish, 4.0–8.5 mm long, in middle of tube sparsely pubescent; ligules recurved, 2.0–4.5 mm long and 0.5–2.0 mm wide, obovate or spatulate, apically somewhat narrowed, obtuse, with two or three rather coarse, acute or finer, obtuse teeth, or sometimes rounded without teeth, or

ovate, abruptly narrowed toward the apex, subacuminate, with obscure teeth, not changing after flowering or convolute into tube; style with branches shorter than ligules; disk florets bisexual, tubular, five-toothed,
278 golden-yellow, after flowering usually becoming reddish, 3.5–5.5 mm long, in middle of tube and on lobes sparsely pubescent. Pappus two-rowed, outer bristles short, few, inner bristles 25–52, 2.5–5.25 mm long; achenes developing only in pistillate florets, oblanceolate, compressed, 3–5 mm long, covered with rather long, semi-appressed, somewhat stiff hairs, not coronate at base of pappus, and with solitary sessile glands. Flowering VI–IX. (Plate XVII, Fig. 2).

On sandy, sandy-stony and rocky slopes of mountains at 1,500–3,500 m. —*Soviet Central Asia*: Pamiro-Alai (excluding the eastern Pamir), Tien Shan (western Tien Shan, in the east up to the Fergana and Susamyr ranges and western terminal spurs of the Kirgiz Alatau). *General distribution*: Iran Region (Afghanistan). Described from Afghanistan (Hajigak Pass) in the Kukhi-baba Mountains. Type in Geneva.

Note. The isotype of *E. cabulicus* (Boiss.) Botsch., kindly sent from Kew, provided an opportunity to determine the features of this species and made it possible to revise its description. The isotype has broader leaves and larger achenes than what is mentioned in the study of Boissier [leaves 8–10 mm wide and not 2 lines (i.e. 5 mm); achenes more or less as long as pappus and not one-third to half as long]. After these corrections, it becomes absolutely clear that *E. cabulicus* (Boiss.) Botsch. is widely distributed from the Kukhi-baba mountains in Afghanistan up to the western terminal spur of the Kirgiz Alatau and the Susamyr Range in Soviet Central Asia. In such a vast area a considerable number of unique morphological forms of *E. cabulicus* (Boiss.) m. will exist. However, in their distribution it is not possible to see a strict geographical or ecological adaptiveness, nor a sufficient clarity in the morphological characters in order to recognize all these forms as geographical races. Only in the remote Kopetdag, as well as in the Varzob River Basin in the Gissar Range, i.e., in places far away from the main range have two unique geographic races evolved that deserve recognition as subspecies. But here, in conformity with the conventions followed by the team of authors of the *Flora of the USSR*, they are described as the separate species *E. dolichostylus* m. and *E. biramosus* m.

67. **E. dolichostylus** Botsch. sp. n. in Addenda XXIV, 588.

Perennial. Caudex woody, branched, many-headed; stem erect or ascending, 2–30 cm high and about 1 mm thick, leafy, simple, single-headed or once, rarely twice, branched, with two to four capitula. Leaves green, like stem sparsely covered with stiff, rather long, multicellular, spreading hairs and short-stalked, capitate glands, more numerous in upper parts of plant; basal leaves 1.5–10.0 cm long and 1.5–8.0 mm wide, 279 linearly lanceolate, acuminate, long-petiolate, entire or sometimes with occasional, small, acute teeth; cauline leaves 0.5–5.0 cm long, 1–6 mm wide, linearly lanceolate, acute, entire, lower leaves short-petiolate, upper ones sessile. Capitula about 1 cm long and 2 cm wide. Involucral bracts three-rowed, linearly lanceolate, 6–7 mm long and almost 1 mm wide, dorsally with numerous, short-stalked, capitate glands and somewhat long, erect, stiff, sparse, multicellular hairs, scarious along margin and apically fimbriate. Ray florets pistillate, as long as pappus or slightly longer, yellow but becoming red after flowering, about 5.5 mm long, throughout tube sparsely pubescent, ligules recurved, about 2 mm long and 1 mm wide, ovate, with two or three rather large teeth at apex, becoming revolute after flowering; style with equal filiform branches as long as perianth; disk florets bisexual, tubular, five-toothed, yellow but becoming red after flowering, 4.5–5.5 mm long, in lower half of tube sparsely hairy but on teeth with few, rather long, erect, multicellular hairs. Pappus two-rowed, 4.5–5.5 mm long, short bristles equal (some slightly shorter), 30–40; achenes developing only in pistillate florets, lanceolate, compressed, about 4 mm long, covered with sessile glands and scattered, rather long, semi-appressed, somewhat stiff hairs, not contiguous at base of pappus. Flowering VII–IX.

On rocks, at 2,700 m. —*Soviet Central Asia*: Mountainous Turkmenia (Rizarash and Chapandag mountains). *General distribution*: Iran Region. Described from Soviet Central Asia (Rizarash Mountain in Kopetdag). Type in Leningrad.

68. **E. biramosus** Botsch. sp. n. in Addenda XXIV, 588.

Perennial. Caudex woody, branched, many-headed. Stems numerous, ascending, with many leaves and twice branched, 15–35 cm high, densely covered with spreading, not very short, multicellular, stiff hairs and short-stalked, capitate glands. Leaves canescent due to somewhat dense, spreading, not very short, multicellular, somewhat stiff hairs and short-stalked, capitate glands; basal leaves oblanceolate, acute, long-petiolate, entire or less often sparsely fine serrate, 4–9 cm long and 0.5–1.3 mm wide, withering early; cauline leaves 0.5–9.0 cm long and 0.1–1.3 cm wide, lower leaves oblanceolate, acute, entire or less often sparsely fine-serrate, petiolate, upper lanceolate, acute, entire, sessile. Inflorescence corymbose-paniculate. Capitulum more or less 0.9 cm long and 1.8 cm wide. Involucral bracts more or less similar, about 6 mm long and 1 mm wide, not longer than pappus, linearly lanceolate, 280 gradually acuminate, densely covered dorsally with spreading, not very short, multicellular, stiff hairs and short-stalked, capitate glands, along margin scarious and fimbriate particularly at apex. Ray florets pale yellow, pistillate, about 5 mm long, in middle of tube sparsely pubescent; ligules recurved, about 2.5 mm long and 0.8 mm wide, oblong-obovate, with two or three small teeth or at apex, style branches shorter than ligule; disk florets bisexual, tubular, five-toothed, pale yellow, about 5 mm long, sparsely hairy in middle, but on teeth with few rather long, articulate somewhat, stiff, spreading hairs. Pappus two-rowed, long bristles 35, 5 mm long, short ones few; achenes developing only in pistillate florets, covered with rather long, semi-appressed, somewhat stiff hairs forming corona at base of pappus. Flowering VII.

Sandy slopes, at 2,500–3,000 m. —*Soviet Central Asia*: Pamiro-Alai (Gissar Range, Varzob River Basin). Endemic. Described from the Varzob River Basin in the Gissar Range). Type in Leningrad.

Section 2. EUCONYZASTRUM Botsch. —Annuals or biennials. Stem strongly branched.

69. **E. khorossanicus** Boiss. Fl. or. III (1875) 170; O. and B. Fedtsch. Perech. Rast. Turk. IV, 166; Pavlov, Fl. Tsentr. Kazakhst. III, 227, p. p. excl. pl. Krascheninnikoviana; Popov in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, No. 7, 11, p. p. excl. syn. *Conyza iliensis* Trautv. —*Conyza krausseana* Rgl. and Schmalh. in Tr. Peterb. Bot. Sada, V, 2 (1878) 616; O. and B. Fedtsch. Perech. Rast. Turk. IV, 170. —*C. khorossanica* Boiss. ex Rgl. and Schmalh. op. cit., p. 617. —*C. khorossanica* Novopokr. ex Nevski in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, No. 4 (1937) 278.

Biennial, very rarely perennial. Grayish or green, densely, particularly in upper part, or less densely covered with stiff, rather long, spreading, simple hairs and short-stalked, capitate glands, sometimes glands in upper parts and particularly on involucral bracts predominant. Stems not woody, densely leafy, usually branched in upper half, solitary, erect, rather thick (2–8 mm), high (25–125 cm) or many, ascending, more slender (0.5 to 4.0 mm thick), and short (1.5 to 55 cm); basal and lower cauline leaves petiolate, oblanceolate, acute, sparsely, finely, and sharply serrate, very rarely almost entire, 2–18 cm long and 1–4 cm wide; upper leaves and leaves on branches similar but sessile and smaller, entire or few-toothed; uppermost leaves sessile, linear, acute, entire, 0.3–3.0 cm long and 0.1–0.3 cm wide; basal leaves
281 withering early; sterile, long lasting, rosettes of leaves developing in many-stemmed specimens between stems. Inflorescence racemose- or corymbose-paniculate. Capitula 1.2–2.0 cm wide and 0.8–1.0 cm long. Involucral bracts slightly shorter than pappus, about 3.5–4.0 mm long, linearly lanceolate with recurved ciliate-fimbriate apex; inner bracts

with scarious margin. Ray florets pale yellow (straw-colored), after flowering sometimes becoming red, pistillate, tubular, about 4 mm long, almost as long as pappus or shorter, sparsely hairy in middle with appressed hairs, along upper margin glabrous, obliquely truncate, bearing three short, obtuse teeth, i.e., with very short ligule; only style branches exserted from tube; disk florets pale-yellow (straw-colored), often becoming red after flowering, about 4 mm long, almost as long as pappus, bisexual, tubular, five-toothed, in middle and at apices of teeth sparsely covered with appressed hairs, hairs on teeth much longer and fine. Pappus two-rowed, outer hairs very short, inner about 4 mm long; achenes developing only in pistillate florets, oblanceolate, compressed, 2.5–3.0 mm long and 0.6–0.75 mm wide, with each rib one-veined, covered with rather long, semi-appressed, erect, somewhat stiff, numerous hairs and few sessile glands. Flowering VI–VIII. (Plate XVII, Fig. 1).

In foothills and mountains up to subalpine zone on dry or more or less moist, mainly sandy slopes, often among trees and shrubs. —*Soviet Central Asia*: Pamiro-Alai (excluding the Pamir), Tien Shan (excluding central Tien Shan), mountainous Turkmenia. *General distribution*: Iran Region. Described from Iran (mountains between towns of Neyshabur and Mashhad). Type in Paris; isotype in Leningrad.

Note. Among the abundant herbarium material of *E. khorossanicus* Boiss. from its entire area of distribution, a large number of the plants have many comparatively low, slender, ascending stems. Some of these plants are definitely perennials, as evidenced by the remains of previous years' stems. The majority of the many-stemmed plants have sterile rosettes of basal leaves, which do not wither for a long time. They usually also have a somewhat impoverished inflorescence. In all other aspects they are identical to the single-stemmed specimens of *E. khorossanicus* Boiss. All this is sufficient to confirm the neutral "perennialty" of *E. khorossanicus* Boiss. In some many-stemmed specimens from the Pamiro-Alai the florets turn pinkish after drying and do not remain pale yellow, as always happens with *E. khorossanicus* Boiss.; regarding the shape of the leaves, degree of development of the ligule of the pistillate florets, density of pubescence, and other characters these plants vary quite considerably. Similar plants have been described as *E. androssovii* M. Pop. (*Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR* VIII 282 (1940) 55). Obviously, it is most appropriate to consider, as Popov also suggests, that such plants are the hybrids of *E. khorossanicus* × *E. pseuderigeron*.

70. **E. nigromontanus** Boiss. and Buhse in Nouv. Mém. Soc. Nat. Mosc. XII (1860) 114, non M. Pop. (1940); Botschantzev in Bot. Mat.

Gerb. Bot. Inst. Akad. Nauk SSSR, XVI, 385. —*Conyza iliensis* Trautv. in Bull. Soc. Nat. Mosc. XXXIX, 2 (1866) 342; O. and B. Fedtsch. Perech. Rast. Turk. IV, 170. —*Brachyactis iliensis* Rupr. in Mém. Acad. Sc. Pétersb., sér. 7, XIV, 4, (1869) 51. —*Erigeron aucheri* Boiss. Fl. or. III (1875) 170, p. p. quoad syn. *E. nigromontanus* Boiss. and Buhse; Grossh. Fl. Kavk. Izd. 1, IV, 97. —*E. kazachstanicus* Serg. in Sist. Zam. Gerb. Tomsk. Univ., 1–2 (1949) 16; Krylov, Fl. Zap. Sib. XI, 2690. —*Conyza kazachstanica* Serg. ex Krylov ibid. 2691. —*Erigeron khorossanicus* auct., non Boiss.; Pavlov, Fl. Tsentr. Kazakhst. III (1938) 22, p. p. quoad pl. Krascheninnikovianam; Popov in Tr. Uzbeksk. Gos. Univ., Nov. Ser. 27, Biol., No. 14 (1941) 73, p. p. quoad syn. *Conyza iliensis* Trautv.; ej. in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, No. 1, 11.

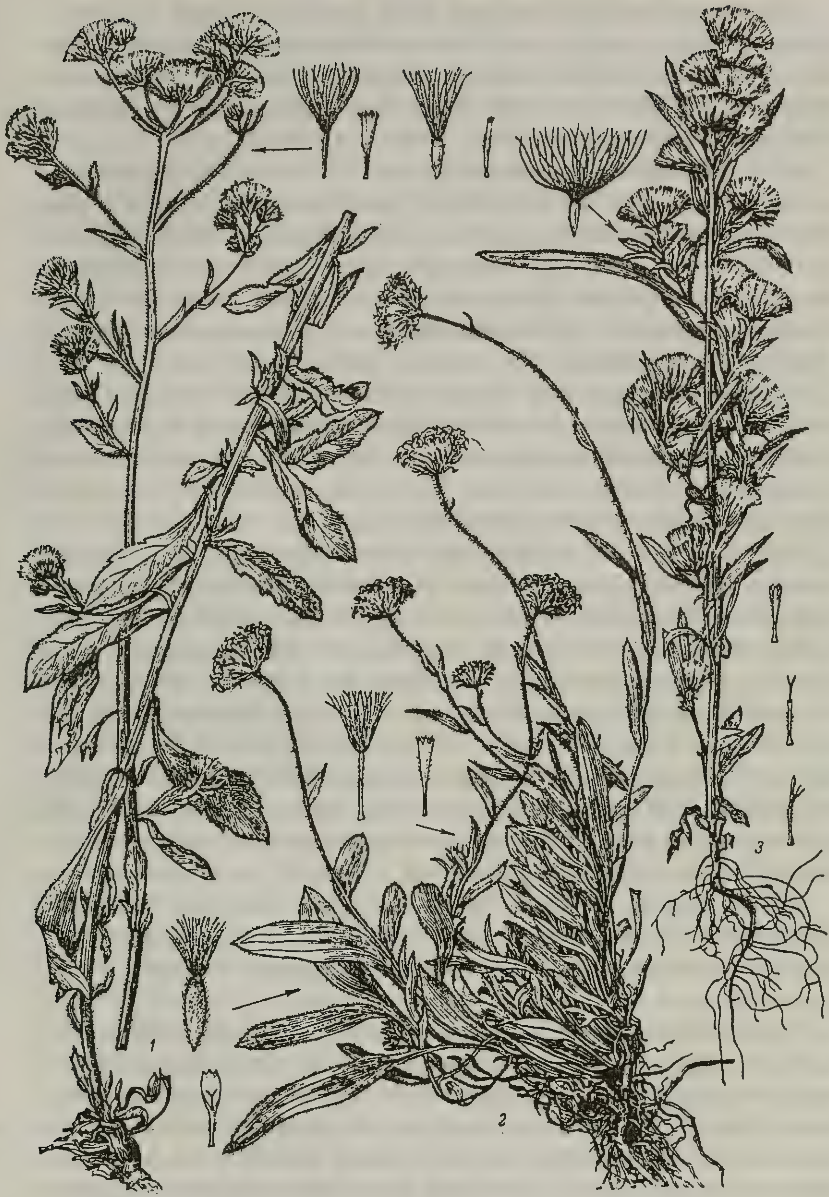
Biennial. 10–55 cm high, canescent plant, covered with rather dense, somewhat stiff, simple, spreading hairs and numerous short-stalked glands; stem solitary, straight, longitudinally striate, sometimes reddish below, densely leafy, in upper half usually with few short peduncles. Basal leaves obovate or oblanceolate, entire or with few acute teeth at apex, at base narrowed into long petiole, early withering, up to 8 cm long and 1.7 cm wide; lower cauline leaves oblanceolate, petiolate, acute, remotely and sharply toothed; middle leaves similar, but sessile and semiamplexicaul; other cauline leaves and leaves on branches similar to middle cauline leaves but smaller and usually entire. Inflorescence corymbose-paniculate, with branches bearing one to three capitula. Capitula small, about 1.5 cm wide and 0.7 cm long. Involucre slightly shorter than pappus. Involucral bracts linearly lanceolate, gradually acuminate, scarious along margin and fimbriate. Ray florets pistillate, colorless, tubular, including style about 3 mm long, with tube half to four-fifths as long as style, about half as long as pappus, obliquely incised above, without teeth but with cilia scattered even on upper half of tube; disk florets colorless, tubular, five-toothed, bisexual, about 3.5 mm long, almost as long as pappus, with few rather long, fine, 285 straight hairs at apices of teeth projecting above but quite often fragile, hairs in middle of tube short and somewhat thick. Pappus two-rowed, bristles few, outer very short, inner thin, long, 4–5 mm long, 18–24, two-times as long as achenes; achenes developing only in pistillate florets, oblanceolate, compressed, about 1.8–2.25 mm long and 0.5–0.75 mm wide, not very densely covered with semi-appressed, short, somewhat stiff hairs and few sessile glands; shrivelled achenes of bisexual florets linear. Flowering VII–IX.

Steppe- and floodplain meadows, near springs, often a weed. —*Caucasus*: Eastern Transcaucasia, Talysh; *Soviet Central Asia*: Aralo-Caspian (east), Balkhash Region. *General distribution*: Armenia and

Kurdistan, Iran. Described from northern Iran (Karadag Mountains). Type in Leningrad.

71. **E. umbrosus** (Kar. and Kir.) Boiss. Fl. or. suppl. (1888) 290. —*E. umbrosus* M. Pop. in Tr. Uzbeksk. Gos. Univ., Nov. Ser. 27, Biol., No. 14 (1941) 73; in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, No. 7, 11. —*Conyza umbrosa* Kar. and Kir. in Bull. Soc. Nat. Mosc. XV (1842) 379; Ldb. Fl. Ross. II (1845) 498; O. and B. Fedtsch. Perech. Rast. Turk. IV, 169. —*C. roylei* DC. Prodr. V (1836) 381, non *Erigeron roylei* DC. ibid., p. 292. —*?Brachyactis gymnocephala* Rupr. in Mém. Acad. Sc. Pétersb., sér. VII, XIV, 4 (1869) 51; O. and B. Fedtsch. Perech. Rast. Turk. IV, 168. —*?Conyza gymnocephala* Rupr. op. cit., 12. —*Brachyactis umbrosa* Benth. in Hook. Icon. plant., ser. 3, II (1876) 6; Hook. Fl. Brit. Ind. III, 253, p. p. excl. syn. *B. wangtuensis* Clarke. —*?Aster gymnocephalus* B. Fedtsch. Rast. Turk. (1915) 731. —*Brachyactis roylei* (DC.) Wendelbo in Nytt. Magasin for Botan. I (1952) 62. —*Erigeron umbrosus* Buser ex Wendelbo (ibid.).

Annual. Plant 3–35 cm high, rather densely covered with short-stalked glands and simple, long, articulate, spreading hairs. Stems slender, simple, with racemose inflorescence or usually strongly branched from base with ascending, sometimes repeatedly branched shoots and racemose-paniculate inflorescence; peduncles of capitula leafless or with single leaf, usually short, 3–5 mm long, in terminal capitula 1–2(6) cm long. Leaves petiolate, obovate, distant, abruptly and coarsely serrate-crenate, gradually reduced upward, (8.5)4.0–0.5 cm long [of which lamina (3.5)2.5–0.3 cm long] and (3)1.2–0.1 cm wide. Capitula numerous, 1.0–1.8 cm wide and 0.6–0.9 cm long. Involucral bracts linearly lanceolate, mucronate, herbaceous, with scarious margin, apically fimbriate and often violet, half as long or almost as long as pappus. Ray florets pistillate, tubular, colorless, many-whorled, including style about 4 mm long (tube 2.5–3.5 mm long), along upper margin obliquely cut, without teeth but with few cilia of short hairs scattered here and on upper half of tube; very rarely cut of tube becomes very strongly oblique and as if developing a small colorless rudiment of the ligule, also 286 ciliate and lacking teeth; disk florets bisexual, tubular, five-toothed, colorless, as long as pappus, about 4 mm long, sparsely pubescent in middle of tube and along upper portion of teeth; style branches of pistillate florets filiform, but of bisexual florets lanceolate, acute. Pappus two-rowed, outer hairs very short, few, inner fine, up to 4 mm long; achenes developing in all florets, about 2 mm long and 0.75 mm wide, rather densely pubescent with very fine appressed hairs, compressed, each rib one-veined. Flowering VII–IX.



283 Plate XVII.

1—*Erigeron khorossanicus* Boiss., habit, achene of bisexual floret, bisexual floret, achene of ligulate floret, ligulate floret; 2—*E. cabulicus* (Boiss.) Botsch., habit, ligulate floret and achene of ligulate floret (from left), achene of bisexual floret and bisexual floret; 3—*Brachyactis ciliata* Ldb., habit (at the top from left), bisexual floret, tubular pistillate floret, ligulate floret.

Mountains, shade of forest and rocks, crevices of rocks and stony slopes. —*Soviet Central Asia*: Dzhungaria-Tarbagatai, Pamiro-Alai, Tien Shan. *General distribution*: Iran Region, Indo-Himalayas, Dzhungaria-Kashgaria, Tibet. Described from Soviet Central Asia (from the Sarkand River in the Dzhungarian Alatau). Type in Leningrad.

Note. I was not able to locate the type of *Brachyactis gymnocephala* Rupr. It was not described clearly. Nevertheless, on the basis of the characters mentioned by the author and also because of the fact that in the central Tien Shan (from where *B. gymnocephala* was described) only *Erigeron umbrosus* (K. and K.) Boiss., which conforms to these characters, is found, it can be presumed that *B. gymnocephala* Rupr. is a synonym of *E. umbrosus* (K. and K.) Boiss.

Brachyactis wangtuensis Clarke, cited by Hooker in *Fl. Brit. Ind.* III, 253, as a synonym of *B. umbrosa* Benth., if judged only on the basis of its original description (Clarke *Comp. Ind.*, 1876, 61, sub Conyza), is quite clearly distinguished from *B. umbrosa* Benth., and, evidently, ought to be excluded from synonyms.

The earliest name for this plant is *Conyza roylei* DC. (l. c.). However, our plant already had long and absolutely correctly been placed in the genus *Erigeron* L., because it has two or three whorls of pistillate florets, compressed achenes with two ribs, and two-rowed pappus with very short outer bristles. It was transferred [to *Erigeron*] with another, later specific epithet because an *E. roylei* DC. (l. c.) already existed. It is incorrect to place our plant in the genus *Brachyactis* Ldb., because *Erigeron umbrosus* (K. and K.) Boiss. does not have the terete achenes, cartilaginous cilia and cartilaginous sharp points on the leaves and involucral bracts and also the two-rowed pappus of equal bristles, which characterize the genus *Brachyactis* Ldb.

Considering all the above facts, I am convinced that Wendelbo mistakenly transferred *Erigeron umbrosus* (K. and K.) Boiss. to the genus *Brachyactis* Ldb. under the name *B. roylei* (DC.) Wendelbo (l. c.).

72. **E. crispus** Pourr. in Mém. Acad. Toulouse III (1788) 318; Grossh. Fl. Kavk., Izd. 1, IV, 97. —*E. linearifolius* Cav. in Anal. Cienc. Nat. IV (1801) 89. —*E. linifolium* Willd. Sp. pl. III, 3 (1804) 1955; 287 Boiss. Fl. or. III, 169. —*Conyza ambigua* DC. Fl. Fr. V (1815) 468. —*Dimorphanthes ambigua* Presl. Fl. Sic. I (1826) XXVIII. —*Eschenbachia ambigua* Moris, Fl. Sard. 2 (1840–43) 372. —*Dimorphanthus linifolius* Rupr. in Bull. Phys.-Math. Acad. Sc. Pétersb. XIV (1856) 234. —*D. crispa* Rupr. Ibid. p. 235. —*Conyza crispa* Rupr. Ibid. p. 235. —*Leptilon linifolium* Small, Fl. Southeast. U.S. (1903) 1231. —**Ic.**: Fiori and Poal. Ic. Fl. Ital. 418; Reichenbach Ic. Fl. Germ. XVI, t. 913. —**Exs.**: Fl. Palest. exsic. No. 93.

Annual. Stem 30–70 cm high, straight, weakly branched above, profusely leafy, densely pubescent with short stiffish, upcurved, simple and scattered, stiff, long, upright simple hairs. Leaves acute, canescent due to dense, short, upright, stiff, simple hairs along margin and on both sides, 0.3–7.0 cm long and 0.3–10.0 mm wide; lower leaves linearly lanceolate, petiolate, sparsely serrate with long, somewhat stiff, simple, upright hairs; upper leaves linearly oblong, sessile, entire. Inflorescence broad paniculate; capitula not very numerous, about 6 mm long and 12 mm wide. Inner involucral bracts about 4.5 mm long and 0.5 mm wide, linear, acute, herbaceous, scarious along margin, apically ciliate, dorsally with stiff, scattered, upright, simple hairs; outer bracts half as long, herbaceous, more densely pubescent. Receptacle tuberculate, scabrous hilum of achenes almost similar in size. Ray florets pistillate, very short, in several whorls, 3.25–3.8 mm long, with occasional short hairs in upper part of tube; ligules erect, white, later becoming pink, about 0.3–0.5 mm long, linear, with three tiny, acute teeth at apex; style branches linear, not longer than ligule; disk florets pale yellow or greenish-yellow, bisexual, tubular, five-toothed, about 3.5 mm long, with occasional short hairs on teeth, in upper part cylindrical. Anthers exserted from tube; style branches linearly lanceolate, acute. Pappus 3.0–3.6 mm long, usually consisting of 20 hairs of equal length in one whorl; achenes about 1.5 mm long, linearly lanceolate, sparsely covered with fine appressed hairs, compressed, developing in all florets. Flowering VI–X.

In weed-infested places, along irrigation channels and on coastal sands. —*Caucasus*: Western and eastern Transcaucasia (at the mouth of Kura River); *Soviet Central Asia*: mountainous Turkmenia (Ashkhabad). An introduced plant. Described from the vicinity of Narbon. Type in Paris.

Note. L.M. Kemularia-Nathadze in the *Flora of Georgia* VIII (1952) 252 (in Georgian language) mentioned *E. liniflorus* Willd. Sp. pl. III (1804) 1855 as a synonym of *E. crispus* Pourr. Several errors had crept into this reference. On the indicated page in the work of Willdenow we find species of another genus, but at the corresponding place among *Erigeron* L. there is no *E. liniflorus* Willd. Willdenow never described 288 such a species. Obviously, in the *Flora of Georgia* the author was referring to *E. linifolium* Willd. which is, in fact, a synonym of *E. crispus* Pourr., but for some strange reason, *E. linifolium* Willd. had been included in the *Flora of Georgia* as a synonym of *E. bonariensis* L.

GENUS 1478. **Lachnophyllum** Bge.[1,2]

Bge. in Reliq. Lehmann. (1851) 151.

Capitula in paniculate inflorescence, many-flowered with florets of different sexes and colors. Ray florets pistillate, two-whorled; ligules blue, after flowering becoming revolute; style branches filiform. Disk florets bisexual, yellow, tubular, five-toothed; anthers without basal appendages; style branches linearly lanceolate, acute. Pappuses of all florets alike, one-rowed, bristles of equal length, basally connate, thin, yellow, finely scabrous; achenes developing in all florets, oblanceolate, below pappus elongated, flattened, with veined ribs, pubescent. Receptacle flat, alveolate. Involucre imbricate, five- to seven-rowed; involucral bracts stiffish, linearly lanceolate, acute, recurved. Annual, pleasantly aromatic plant, covered with long hairs and glands. Leaves alternate, undivided and entire.

The genus comprises two species.

Type species: *L. gossypinum* Bge.

1. **L. gossypinum** Bge. in Reliq. Lehmann. (1851) 151; Boiss. Fl. or. III, 172; O. and B. Fedtsch. Perech. Rast. Turk. III, 167. —**Ic.**: Grigorev, Opredel. Rast. Okr. Stalinabada, Fig. 51. —**Exs.**: Ed. H.B.P. No. 26; Sintenis, It. transc.-pers. 1900–1901, No. 1174.

Annual. Densely lanate when young and also glandular with stalked, capitate glands, later considerable part of simple hairs wearing off. Stem erect, usually two to three times branched, forming panicle, leafy, 3–80 cm high. Lowermost leaves petiolate, obovate, obtuse, 0.4–1.7 cm wide and 1.5–4.5 cm long; middle cauline leaves sessile, semiamplexicaul, ovate, acuminate, with small round auricles at base, 0.3–2.4 cm wide and 1.0–4.7 cm long; uppermost leaves linearly lanceolate, acute, about 0.75 mm wide and 3 mm long. Capitula 0.9–1.1 cm long and 1.2–1.6 cm wide. Involucre five- to seven-rowed, imbricate; involucral bracts recurved, outer lanceolate, herbaceous, about 3.2 mm long and 0.75 mm wide; inner ones linearly lanceolate, stiffish with 289 membranous margin and green midrib, about 8.5 mm long and 0.5 mm wide. Ray florets ligulate, pistillate, two-whorled, about 1 cm long; of these the blue broadly linear ones with rounded or tapered and finely obtuse three-toothed apex; ligule about 5.5 mm long; tube sparsely pubescent (much denser above) with spreading hairs; disk florets bisexual, conical, yellow, numerous, about 7 mm long, with five equal

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[1] Treatment by V.P. Botschantzev.

[2] From the Greek words *lachne*—wool, and *phyllon*—leaf; named so because of the dense soft hairs of the plant.

teeth, sparsely pubescent on teeth and in upper part of tube. Pappus bristles 40–47, 5.0–5.8 mm long; achenes 2.1–2.5 mm long. Flowering VIII–XII. (Plate XVI, Fig. 1).

Foothill-plains, lower and sometimes middle mountain zones on sandy and gravelly soils, sometimes as weed. —*Soviet Central Asia*: mountainous Turkmenia, Syr-Darya, Pamiro-Alai, Tien Shan. *General distribution*: Iran Region (Afghanistan). Described from the Karnaptau Mountains and the vicinity of Samarkand. Type in Leningrad.

Economic Importance. Strongly aromatic plant. S.N. Kudryashov recommends the volatile oil of this plant for the perfume industry.

Subtribe 5. **BACCHARIDINAE** O. Hoffm. in Pflanzenfam. IV, 5 (1889–1894) 170. —All florets in capitulum tubular or filiform. Mostly dioecious shrubs or semishrubs, found as wild only in America.

GENUS 1479. **Baccharis** L. [1, 2]

L. Sp. pl. (1753) 860

Dioecious shrub with alternate leaves. Capitula in paniculate inflorescence. Involucre campanulate; bracts imbricate, many-rowed, outer ones shorter. Receptacle glabrous, alveolate; pistillate florets tubular, five-toothed; style branches glabrous, linear; pappus longer than florets; achenes lanceolate^{+}, oblongly sulcate-ribbed, terete. Bisexual florets tubular, five-toothed; style branches ovate, pubescent; anthers without basal appendages, roundish; pappus more or less as long as florets; achenes not developing.

1. **B. halimifolia** L. Sp. pl. (1753) 860. —*Conyza halimifolia* Desf. Tabl. ed. II (1815) 114. —**Ic.**: Britt. and Brown Ill. Fl. N.U.S. III, 445, fig. 4375.

Cultivated. Branched, glabrous, densely leafy shrub, 1–3 m high; young shoots angular. Leaves glaucescent-green, thick, 1.2–8.5 cm long and 0.2–7.0 cm wide, on stem and larger branches ovate or deltoid-obovate, petiolate, coarsely crenate; on terminal shoots oblanceolate, 290 petiolate or sessile, few-toothed at apex or entire. Capitula in terminal panicles. Involucral bracts coriaceous; outer bracts roundish, small, middle ones ovate, longer; inner bracts longest (3.5–4.3 mm long and 0.7–1.0 mm wide), lanceolate, acute, white membranous along margin, at apex finely ciliate-lacerate. Pistillate florets white, tubular, about 3.7 mm

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[1] Treatment by V.P. Botschantzev.

[2] From *Bacchus*—the god of wind and art of wine-making.

long (narrow conical tube about 3 mm long and exserted, style branches about 0.7 mm long), sparsely pubescent in upper half and with five small, narrow, acute teeth. Pappus two-rowed, bristles (more than 50) slightly scabrous, gradually tapering toward tip, easily breaking off where attached, up to 12 mm long; achenes 1.3–1.6 mm long. Bisexual florets tubular, glabrous, about 3.5 mm long, with five relatively large (up to 1 mm long), acute, yellow, recurved teeth; pappus one-rowed, more or less equaling tube. Flowering IX–XI.

Marshy places. —*Caucasus*: Western Transcaucasia. (Introduced plant.) Cultivated in Soviet Central Asia (Ashkhabad). Described from North America. Type in London.

Tribe 3. **INULEAE** Cass. in Bull. Soc. Philom. Paris (1812) 190, (1815) 173 and in Dict. Sc. Nat. XX (1821) 374, XXIII (1822) 559, XLIX (1827) 223, LX (1830) 579; O. Hoffm. in Pflanzenfam. IV, 5 (1889–1894) 172. —Trib. Asteroideae Less. Synops. Compos. (1832) 161, p.p. —Trib. Senecionideae Less., Ibid. 218, p.p. —Trib. Inuloideae Benth. in Benth. and Hook. f. Gen. Pl. II (1873) 180. —Trib. Astérées Baill. Hist. des Plantes VIII (1882) 71, p.p. —Capitula heterogamous or homogamous; florets in capitulum tubular or filiform-tubular, peripheral florets often ligulate. Receptacle glabrous, more or less smooth or alveolate or receptacle chaffy; anthers usually with long setaceous or caudate basal appendages; style branches usually linear, apically obtuse or more or less truncate, in sterile florets style often simple (not branched). Corolla of disk florets usually yellow, of ray florets also usually yellow or (less often!) differently colored. Leaves with rare exception alternate; plant often tomentose.

Herbs, semishrubs, or shrubs spread all over the world, but having many genera with species found only in limited areas; a few arborescent Inuleae found also in tropics.

KEY TO GENERA OF TRIBE INULEAE[1]

1. Achenes beaked, viscid, terminating into patelliform or shallowly infundibular areole, cartilaginous and somewhat thickened along edges (considered by some authors as a "ring-291 shaped pappus" or "annular disk")...............1501. **Carpesium** L.

+ Achenes not beaked, viscid...2.

2. Receptacle chaffy. Achenes of pistillate florets up to half their length adnate with receptacular scales, achenes of bisexual

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[1] Compiled by M.E. Kirpicznikov.

florets adnate with one or two receptacular scales, less often free; besides, achenes covered with fine, long (several times longer than their diameter), apically bifurcated hairs (and also shorter, thick, capitate, glandular hairs)..1481. **Symphyllocarpus** Maxim.

+ Receptacle glabrous or almost so (with occasional long hairs), but if chaffy then achenes free (not adnate with receptacular scales) and without fine, long, apically bifurcated hairs...............3.

3. All ovaries and achenes without pappus...................................4.

+ All ovaries and achenes or at least some with pappus..................8.

4. Achenes in their upper part covered with larger, viscid glands on thick stalks; florets in center of capitulum sterile. In the USSR plants found only in the Far East..1502. **Adenocaulon** Hook.

+ Achenes without large, viscid, stalked glands; florets in center of capitulum usually fertile..5.

5. Peripheral florets very short-ligulate, uniseriate, pistillate; central florets tubular, numerous, bisexual; achenes swollen above. In the USSR plants found only in Transcaucasia..1500. **Amblyocarpum** Fisch. and Mey.

+ Ligulate florets absent; central florets tubular, bisexual, few. Achenes not swollen above..6.

6. Pistillate florets closely surrounded by inner involucral bracts ....7.

+ Pistillate florets not closely surrounded by inner involucral bracts. Plants tomentose, annual...............................1485. **Evax** Gaertn.

7. Inner involucral bracts with distinct processes on the back, woody, weakly pubescent. Annual plant with opposite cauline leaves, densely, covered with fine hairs, often sericeous..1482. **Micropus** L.

+ Inner involucral bracts without dorsal processes (smooth), coriaceous, densely tomentose throughout. Annual plant with alternate cauline leaves, densely lanate-tomentose...1483. **Bombycilaena** (DC.) Smoljan.

8. Pappus simple, represented by short cartilaginous crown or one-rowed bristles connate at base, much shorter than achenes.........9. 292

+ Pappus double or it consists of one to several rows of free or connate hairs (or bristles), more or less as long as or longer than achenes...10.

9. Outer involucral bracts spinescent; peripheral achenes clearly differ in form from central ones, both covered with stiff hairs at least along wing-like processes........................1503. **Pallenis** Cass.

+ Outer involucral bracts not spinescent; peripheral achenes hardly differ in form from central ones, both wingless, distinctly ribbed longitudinally, inconspicuously (under strong magnification!), softly pubescent..1504. **Telekia** Baumg.

10. Pistillate florets closely surrounded by inner involucral bracts ....11.

+ Pistillate florets not closely surrounded by inner involucral bracts ....12.

11. Ovary and achenes of pistillate florets without pappus, bisexual florets with one-rowed pappus of few hairs; innermost involucral bracts carinate, strongly pubescent on the outside; annual, with stems solitary, often prostrate, divaricately branched above, less often simple..............................1484. **Cymbolaena** Smoljan.

+ Ovary and achenes of all florets with pappus, or pappus absent only in outer pistillate florets; innermost involucral bracts flat, very rarely slightly concave, glabrous or weakly pubescent on the back; annuals, mostly villous-lanate..................1486. **Filago** L.

12. Pappus double, outer whorl of short lamelliform hairs connate at base into unevenly toothed crown, inner whorl of long scabrous (more or less pinnately toothed) hairs.............................. ....1499. **Pulicaria** Gaertn.

+ Pappus of each achene represented by hairs or bristles of same structure..13.

13. Semishrubs with erect, virgate, densely branching stems, covered, as also the leaves, with glands of two types: sessile and short-stalked; involucral bracts five- or six-rowed, scale-like, outermost with sessile glands; capitula relatively few-flowered, comprising approximately 15–35, exclusively bisexual florets ....1498. **Varthemia** DC.

+ Usually perennial, less often biennial or annual plants, but sometimes also semishrubs, but then involucral bracts otherwise; capitula heterogamous or homogamous, as a rule with considerably larger number of florets..14.

293 14. Pappus hairs connate at base into tufts, consequently appearing branched; white-tomentose perennial plants growing in Caucasus...1494. **Cladochaeta** DC.

+ Pappus hairs or bristles not connate into tufts, separately attached to apex of ovary or achene or connate at base into more or less distinct ring; plants of diverse habit..........................15.

15. Pappus hairs long plumose, soft. Low-growing annuals (3–12 cm high), densely pubescent from base, strongly branched, forming small cushions. In the USSR so far found only in Apsheron Peninsula...1490. **Lasiopogon** Cass.

+ Pappus hairs or bristles not long plumose. Mainly perennials, less often semishrubs or annuals of diverse habit......................16.

16. Capitula few (sometimes solitary), compactly aggregated, surrounded beneath by a rosette of bracteal leaves, as a rule spreading and clearly differing from upper cauline leaves by size, pubescence, or color, forming thus a "star," as it were, subtending inflorescence, and absent only sometimes (in *Leontopodium nanum* and *L. leontopodioides*), but then achenes of fertile pistillate florets very tiny (not exceeding 1 mm in length and usually even smaller) with pappus 6–10 times as long as achenes (with hairs up to 9 mm long). Involucral bracts in two to a few rows, herbaceous, more or less homogeneous, along margin and at apex finely membranous, lanate outside..........1488. **Leontopodium** R. Br.

+ "Stars" subtending capitulum or compound inflorescence not present. Achenes larger or involucral bracts different...............17.

17. Plants dioecious or almost so...18.

+ Plants exclusively monoecious..19.

18. Dioecious plants with two types of florets: on some specimens, capitula with pistillate florets, on others, florets staminate (bisexual but with aborted ovary). Herbaceous perennials; with rosettes of basal leaves, often with creeping and rooting or erect shoots, densely covered in lower part with remains of dead leaves. In the USSR plants distributed in the plains and in mountains of the arctic and forest zones................................. ....1487. **Antennaria** Gaertn.

+ Dioecious or more often almost dioecious plants with three types of florets: on some specimens capitula with pistillate florets; pistillate florets mixed with few sterile staminate florets (2–20) in center; on still other specimens, capitula with only staminate florets. Mainly semishrubs, less often low herbs with long and slender rhizomes; rosette of leaves absent. In the USSR plants distributed only in Soviet Central Asia and only one species (*Anaphalis margaritacea*) is found in eastern Siberia 294 ....1489. **Anaphalis** DC.

19. Involucral bracts coriaceous, densely ciliate along margin with transparent cilia; style branches of bisexual florets almost always only slightly divergent. Receptacle almost glabrous only with occasional long hairs. Leaves thickish, after drying, longitudinally papillose-wrinkled and hispid. Pappus of slender white (transparent) hairs, connate at base, numerous and very shallowly toothed in pistillate florets, in bisexual florets slightly plumose-toothed at apex................................1480. **Karelinia** Less.

+ Involucral bracts herbaceous or scarious, along margin not densely ciliate; style of bisexual florets usually deeply bifid or its branches distinctly divergent. Receptacle without occasional long hairs. Leaves and pappus of various types................................20.

20. Pistillate florets numerous, tubular-filiform, mostly around periphery of capitulum in few (sometimes many) whorls, only rarely ray florets uniseriate; inner tubular bisexual florets relatively few (usually up to 10)..21.

+ Pistillate florets altogether absent or relatively few, and then ligulate, peripheral, all in one whorl, or tubular-filiform, from a few to a complete whorl; tubular bisexual fertile florets predominate in capitulum..22.

21. Capitula arranged one by one on long peduncles exceeding diameter of capitula many times; involucral bracts (in our species!) almost always strongly drooping after fruiting...1491. **Phagnalon** Cass.

+ Capitula aggregated in common (compound) spicate inflorescence or little capitula clustered in compact globose corymb, only as an exception found singly arranged; involucral bracts more or less opened or horizontally spreading after fruiting ....1492. **Gnaphalium** L.

22. All florets in capitulum tubular, bisexual; only sometimes a few peripheral florets pistillate, tubular-filiform, but then involucral bracts scarious or hard-scarious, more or less brightly colored (yellow, golden, lemon-colored, pinkish, milky white, etc.), often lustrous..23.

+ Outer whorl of florets in capitulum ligulate or tubular-filiform, pistillate; involucral bracts herbaceous and only along margin somewhat scarious, not brightly colored................................24.

23. Involucral bracts scarious or hard-scarious, more or less brightly
295 colored. Low plants (8)25–35(50 and very rarely up to 75) cm
high, with basal leaves up to 1.5 cm wide (usually narrower)......
....1493. **Helichrysum** Mill. corr. Pers.

+ Involucral bracts herbaceous, rigid, hard. Robust plants from 65 to 200 cm high, with basal leaves up to 25 cm wide.......... ....1495. **Codonocephalum** Fenzl.

24. Plants with repeatedly branched caudex; stems slender and woody, usually brownish-reddish with small leaves (blade 0.8 to 2.5, rarely up to 4.0 cm long); plants very rarely annual (*Pentanema divaricata*), but then almost dichotomously and divaricately branched from base, with slender reddish-violet virgate branchlets; capitula small, 0.5–1.5 cm wide, solitary or numerous at ends of branchlets; achenes not distinctly ribbed, pilose; pappus of 8–20 or only four or five hairs. Low semishrubs (except annual *Pentanema divaricata*) up to 30 cm high, usually lower, from 7 to 20 cm.......................................1497. **Pentanema** Cass.

+ Plants, as a rule, devoid of caudex; in those individual cases when it is present (*Inula multicaulis*), stem thicker and greenish, but leaves longer (with blade up to 4–5 cm long, at least in some leaves); capitula usually large, often more than 1.5 cm wide, usually numerous and aggregated, in compound corymbose or capitate inflorescences, less often solitary; achenes ribbed, glabrous or pilose; pappus usually of numerous hairs. Mainly perennial herbs, rarely biennials or even annuals, but if annual, then without reddish-violet, dichotomously and divaricately branched stems. Plants often attaining considerable height ....1496. **Inula** L.

Subtribe 1. **PLUCHEINAE** Rchb. Nom. (1841) 91; O. Hoffm. in Pflanzenfam. IV, 5 (1889–1894) 175. —Capitula heterogamous; all florets tubular, bisexual, usually less numerous. Receptacle glabrous, often lacunose or alveolate, or with occasional hairs but not chaffy.

GENUS 1480. **Karelinia** Less.[1, 2]

Less. Linnaea IX (1834) 187; DC. Prodr. V (1836) 375; Benth. and Hook. Gen. pl. II (1873–1876) 291

Capitula heterogamous, many-flowered, clustered in two to nine terminal corymbs. Involucral bracts many-rowed, appressed, imbricate, 296 stiff; outer bracts ovate, inner ones lanceolate and linear. Receptacle flat with long hairs. Florets tubular; peripheral florets pistillate, many-whorled, filiform, with more or less unevenly four-toothed corolla; disk florets bisexual, 10–20, with regular five-toothed corolla; anthers shortly caudate at base; styles of pistillate florets glabrous, of bisexual florets with small glandular hairs; achenes small, terate, three- or four-ribbed. Pappus several times longer than achene, in pistillate florets consisting of numerous, fine, elongated, hair-like, minutely serrate bristles; in bisexual florets one-rowed, of few bristles, also minutely serrate but apically barbate, thick. Perennial herbs with simple, sessile, alternate, oblong, along margin uneven, scabrous, semiclasping-auriculate leaves.

A monotypic genus.

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[1] Treatment by L.A. Smoljaninova.

[2] Named after botanist and traveler-explorer G.S. Karelin; this genus was described from his collections.

1. **K. caspia** (Pall.) Less. in Linnaea IX (1834) 187; Ldb. Fl. Ross. II, 498; Boiss. Fl. or. III, 218; Schmalh. Fl. II, 48; O. and B. Fedtsch. Perech. Rast. Turk. 4, 169. —*Serratula caspia* Pall. Reise II, App. No. 121, tab. Z (1773) 743–744. —*Pluchea caspia* (Pall.) O. Hoffm. ex Paulsen, in Kjob. Vidensk. Meddel. (1903) 147. —**Ic.**: Pall. l. c. —**Exs.**: GRF No. 923.

Perennial. Stem up to 1.5 m high, erect, cylindrical, ribbed, leafy up to inflorescence, corymbosely branched mainly above, glaucous, glabrous or puberulent; branches alternate, almost of equal length, scabrous. Leaves 2–6 cm long and 0.5–1.5 cm wide, simple, alternate, sessile, oblong, acuminate, glabrous, scabrous, margin uneven, upper leaves basally cordate, semiclasping-auriculate. Capitula 1.3–2.0 cm long and 0.8–2.0 cm wide, heterogamous, many-flowered, in clusters of two to nine in terminal corymbs; peduncles 7–25 mm long and 1 mm wide, scabrous. Involucre cylindrical-campanulate, 13–15 mm long and 7–10 mm wide, six- or seven-rowed; bracts stiff (almost coriaceous), appressed, imbricate, light brown, sometimes reddish at apex, inside glabrous, outside with heavy, short, appressed, gray hairs, ciliate, cilia longer on inner bracts; outer bracts ovate or ovate-oblong, 5–8 mm long and 3–4 mm wide, middle ones lanceolate, 10 mm long and 2 mm wide, inner ones almost linear, 11–15 mm long and 1 mm wide, acuminate. Receptacle flat, with long hairs. Florets tubular, glabrous; peripheral florets pistillate, many-whorled, fertile, reddish, 11–12 mm long, with filiform, more or less unequally, four-toothed corolla, the tube 10 mm long and 0.5 mm wide in upper part; style as long as tube, slender, flat, glabrous, with bifid stigma; stigma lobes short, slender, flat, 3–5 mm long, exserted, slightly divergent, reddish, glabrous. Central florets bisexual, sterile, 10–20, reddish, with five-toothed corolla, 10–12 mm
297 long and 1 mm wide in upper part, teeth 1 mm long, lanceolate, acuminate; anthers oblong, 2 mm long and 0.3 mm wide, glabrous, syngenesious, surrounding style, with short entire basal appendages, filaments of stamens 5–6 mm long and 0.25 mm wide, flat, glabrous, epipetalous at base; style 15 mm long, filiform, 0.3 mm wide, with closely spaced small papillae up to half of its length; stigma bifid, with short (0.5 mm long), erect and touching, reddish papillate lobes; ovary cylindrical, 1.5 mm long and 0.3 mm wide, somewhat compressed, smooth, glabrous. Achenes 1.5–2.0 mm long and 0.3 mm wide, dark-brown, terete, somewhat curved, tapering towards base, three-angled, basally with a ring, glabrous; pappus white, 9–14 mm long, basally sinuous, one-rowed, in pistillate florets consisting of numerous, very fine, tiny, often serrate hairs, in bisexual florets of finely serrate hairs, slightly barbate-thickened at apex.

On wet solonchak and solonetz [saline soil types] meadows, solonetz depressions, along banks of rivers, and salt lakes among sands, on edges of sand dunes. —*European Part*: Lower Volga (Gurev), Trans-Volga (Uralsk); *Soviet Central Asia*: Aralo-Caspian, Balkhash Region, mountainous Turkmenia, Kara-Kum, Kyzyl-Kum, Amu-Darya, Syr-Darya Pamiro-Alai, Tien Shan. *General distribution*: Northeast Iran, northern and western Mongolia, Dzhungaria-Kashgaria. Described from the Caspian Coast. Type in Leningrad.

Note. Differing from the typical form with oblong leaves are f. *angustifolia* Smoljan., narrower and smaller leaves gradually tapering towards base, and also f. *ovatifolia* Smoljan., with ovate leaves. The narrow-leaved form is sympatric with the typical form throughout the range of the species and linked with it through transitional forms.

Lessing (1834) considered the genus *Karelinia* close to *Polypappus* (Baccharis), but Boissier (1875) considered it close to *Conyza*, referred by Hoffman to the subtribe Astereae-Conyzinae. Hoffman (*Pflanzenfam.* IV, V, Abt. 1894) treats *Karelinia* as one of the synonyms of *Pluchea*, which is a member of the subtribe Inuleae-Plucheinae.

The study of *K. caspia* (Pall.) Less. showed that this species is distinguished from members of *Pluchea* by having anthers short-caudate at the, base glabrous achenes, pistillate florets with four-toothed corolla, numerous pappus bristles of pistillate florets, and bisexual florets with barbed-thickened bristles. These characters provide a sound basis to recognize *Karelinia* as a separate genus, which, however, should be included among the genera of subtribe Inuleae-Plucheinae on the basis of its diagnostic features, distinctive of representatives of this subtribe.

Subtribe 2. **Symphyllocarpinae** Smoljan. subtribus nova. —Capitula heterogamous. Ovary of outer pistillate florets fused with recep-
298 tacular scales almost up to middle; ovary of the few central bisexual tubular florets also usually fused with one or two adjacent receptacular scales, less often free.

GENUS 1481. **Symphyllocarpus** Maxim.[1, 2]

Maxim. Prim. Fl. Amur. (1859) 151, t. 8, f. 1; Benth. and Hook. f. Gen. pl. II (1873–1876) 296; O. Hoffmann in Pflzfam. IV, 5 (1897) 180.

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[1] Treatment by L.A. Smoljaninova.

[2] From the Greek words *symphyein*—together, *phyllon*—leaf, *carpos*—fruit (named so probably due to the fusion of the achenes with the receptacular scales).

Capitula 3.0–4.5(6) mm wide, heterogamous, many-flowered, globose, sessile, compactly aggregated in axillary clusters of two to four on forking stem and its branches. Involucre two-rowed, bracts of different shapes, lanceolate, oval, rhombic or obovate, acute, membranous, along margin translucent with fine teeth. Receptacle flat, chaffy. Outer florets of capitulum pistillate, many-whorled, fertile, tubular with filiform, irregular, sometimes more or less regular, three-toothed, more rarely two-toothed, now and then four-toothed corolla; ovary fused with adjacent receptacular scales almost up to middle, without pappus; stigma bifid. Peripheral florets pistillate with three-toothed or two-toothed corolla. Central florets bisexual, tubular, few (6–20), fertile, with campanulate four-toothed, regular corolla; anthers with very short, entire, basal appendages; ovary oblong, fused with one or two adjacent receptacular scales, less often free; pappus absent. Achenes small, terete, smooth, with tiny roundish glands and sparse, long, bifid, glandular hairs. Small annuals with straight, forking stems; leaves alternate, sessile, lanceolate, one- to three-toothed at tip.

Monotypic endemic genus of East Asia.

1. **S. exilis** Maxim. Prim. Fl. amur. (1859) 151; Kom. Fl. Manchzh. III (1907) 651; Kom. and Alis. Opredel. Rast. Dalnevost. Kr., II, 1032; Kitagawa, Lineamenta Fl. Manshuricae III, Appendix I (1939) 472. —**Ic.**: Maxim. op. cit. tab. 8, fig. 1; Bot. Mat. XX.

Annual. Small plant, up to 8(20) cm high, in habit resembling *Myriogyne*, glabrous. Root slender, fusiform. Stem erect, grooved, short-forking above; branches arcuately spreading. Leaves alternate, sessile, in axils of stems, pseudo-opposite or in whorls of four, 12–15(30–45) mm long and 3–4(6) mm wide, lanceolate, with one to three (four to seven) teeth in upper part, narrowed toward base, glabrous; upper and 299 bracteal leaves linear, entire or toothed. Capitula sessile, in axillary clusters of two to four on stem and branches, 3.0–4.5(6) mm thick, many-flowered, heterogamous, globose. Involucre two-rowed; the bracts 1.5–2.5 mm long and 0.5 mm wide, of different shapes: lanceolate, rhombic, oval, or obovate, mucronate, membranous, greenish in center, translucent along margin, with fine teeth, glabrous. Receptacle flat, with chaff; scales of receptacle lanceolate or ovate, fused with ovaries of pistillate florets almost half their length, free above, slightly spreading, at tip acuminate with fine teeth reaching almost to tip of corolla; outer florets pistillate, fertile, many-whorled, tubular, bright yellow, with corolla 0.3–0.6 mm long, filiform, irregular, sometimes almost regular, usually three-fid, less often bifid, now and then four-fid; style 0.8 mm long, filiform; stigma bifid, stigma lobes short, 0.16 mm long, erect, obtuse, linear, 0.06 mm wide, glabrous, slightly divergent; ovary terete, 0.5–1.0 mm long and 0.2 mm wide, stalked, fused with adjoining receptacular scales almost up to middle, with small round glands and glandular, sparse, long, horizontally spreading hairs, with erect glandular hairs at apex; pappus absent. Peripheral florets pistillate with three-fid or bifid corolla. Central florets bisexual, fertile, (6–20), tubular; corolla 0.5 mm long, regular, campanulate with four-fid limb; style slightly exserted from corolla tube, flat; stigma bifid, stigma lobes short, 0.12 mm long, approximate, linear, 0.08 mm wide, flat, obtuse, papillate; stamens four, epipetalous at middle of corolla tube, anthers syngenesious, tiny, 0.25 mm long and 0.12 mm wide, almost globose, apically almost truncate, with very short, entire, free, paired, basal appendages, filaments of stamens 0.25 mm long, flat, glabrous; ovary oblong, 0.5 mm long and 0.2 mm wide, fused with one or two adjacent receptacular scales, less often free, with occasional glandular hairs. Achenes 0.5–1.0 mm long, terete, smooth, capped with remains of corolla, with few very small round glands and sparse, long, glandular bifid, horizontally spreading hairs, with upright hairs above; outer achenes slightly curved, middle ones straight. Flowering VIII.

Silty, flooded and sandy banks as well as silty shallows of Amur and Sungari rivers. —*Far East*: Uda River area, Ussuri. *General distribution*: China (former Girinsk Province). Endemic. Described from the Amur, south of Nikolaevsk. Type in Leningrad.

In the opinion of C.J. Maximowicz (1859), this species can be included in the subtribe Heliantheae-Melampodinae on the basis of the 300 fusion of the pistillate florets with the adjacent receptacular scales. Hoffmann (1897) referred the genus *Symphyllocarpus* to the subtribe Inuleae-Filagininae.

Study of the taxonomic characters of *S. exilis* has shown that it is better to treat this genus as a member of the separate subtribe Inuleae-Symphyllocarpinae Smoljan. In the species belonging to the subtribe Inuleae-Filagininae fusion of the florets with the adjacent receptacular scales is not observed. The species of the subtribe Heliantheae-Melampodinae have pistillate florets with ligulate, more rarely short tubular corolla; sterile, bisexual disk florets, with a simple, undivided stigma; and oblong anthers with apical appendages.

Subtribe 3. **Filagininae**. O. Hoffm. in Pflanzenfam. IV, 5 (1889–1894) 179. —Capitula small, heterogamous. All florets tubular; peripheral florets filiform-tubular. Receptacle chaffy or not. Annual herbs, mostly lanate-tomentose.

GENUS 1482. **Micropus** L.[1, 2]

L. Sp. pl. (1753) 927; Hoffm. in Pflzfam. IV, 5 (1894) 180. —Sect. Acantholaena DC. Prodr. V (1836) 460

Capitula small, heterogamous, solitary in axils of opposite leaves. Outer involucral bracts one-rowed, inconspicuous (sometimes almost absent) translucent, membranous, glabrous; inner bracts enclosing peripheral pistillate florets, four or five, galeate, connate at base, hardened, backside gibbous from toothed projections, with translucent membranous margin at tip, falling with achenes. Florets small, tubular; peripheral florets pistillate, four or five, with filiform corolla laterally fused with ovary, fertile; central florets bisexual, five to seven, sterile, with five-fid corolla; anthers with long, caudate, basal appendages. Achenes small, obovoid, compressed, smooth, glabrous; pappus absent. Leaves sessile, entire, opposite; stems many, erect or spreading. Annual herbs covered with gray appressed, silky-tomentose pubescence.

Monotypic genus.

1. **M. supinus** L. Sp. pl. (1753) 927, (1763) 1313; Boiss. Fl. or. III, 242. —**Ic.**: Rchb. Ic. Fl. Germ. t. XVI (1854), tab. 843, fig. 3.

Annual. Stems 2–20 cm high, solitary or many, erect or spreading, with densely appressed, gray, silky-tomentose pubescence. Leaves op-
301 posite, entire, sessile, flat-spatulate, with blunt, short, thick, yellowish or reddish tip, narrowed toward base, 12–17 mm long and 6–8 mm wide, on both sides with heavy, appressed gray-tomentose pubescence. Capitula solitary, axillary, sessile, 5 mm wide, without bracteal leaves. Outer involucral bracts one-rowed, 1.0–1.2 mm long, inconspicuous, sometimes almost absent, broad-lanceolate or lanceolate, translucent-membranous, glabrous; inner bracts enclosing peripheral pistillate florets 5 mm long, four or five, connate at base, hardened, galeate, backside gibbous from toothed projections, with translucent, membranous margin at tip, dorsally lanate, glabrous inside, falling with achenes. Receptacle flat, in center near bisexual florets with few long translucent, linearly lanceolate, acuminate scales. Florets tubular; peripheral florets pistillate, four or five, with filiform corolla, 1.5–2.0 mm long, laterally fused with ovary; style 1.5–2.0 mm long, stigma bifid, with 0.5 mm long lobes, filiform, glabrous; ovary obovoid, 1.5–2.0 mm long and 1 mm wide, glabrous; central florets bisexual, five to seven (usually six), 2.0–2.5 mm long with five-fid corolla, tube yellowish, limb reddish; style 2.0–2.5 mm long, stigma bifid, lobes 0.2 mm long, ovate or oblong, obtuse, flat, erect, appressed, reddish; style in upper

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[1] Treatment by L.A. Smoljaninova.

[2] From the Greek words *mikros*—small, and *pous*—foot.

part and stigma lobes with short glandular hairs; ovary reduced; stamens epipetalous in middle of corolla tube; anthers syngenesious, 1 mm long, oblong, acuminate, with fine, long, slender, entire, caudate, basal appendages; filaments of stamens long, flat, free. Achenes 1.5–2.0 mm long, obovate, compressed, smooth, glabrous. Flowering IV–V. (Plate XVIII, Fig. 2).

Usually on dry, open, sunny, stony calcareous and grassy slopes of lower and middle mountain zones up to 1,200 m. —*Caucasus*: Southern and eastern Transcaucasia. *General distribution*: Western and eastern Soviet Central Asia, Balkans-Asia Minor, Armenia and Kurdistan, Iran. Described from western Europe. Type in Geneva.

GENUS 1483. **Bombycilaena** (DC.) Smoljan.[1, 2]

Smoljan. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVII (1955) 448. —*Micropus* sect. *Bombycilaena* DC. Prodr. V (1836) 460

Capitula small, heterogamous, two or three clustered in globose head, 6–8 mm (1.0–1.2 cm) wide, terminal or axillary. Bracteal leaves 302 longer or shorter than inflorescence. Outer involucral bracts one-rowed, flat, oval, oblong-lanceolate or linearly oblong, 1.5 mm long, translucent-scarious, herbaceous at base, glabrous inside, dorsally pubescent; inner bracts enclosing pistillate florets, five to nine, galeate, inside glabrous, dorsally gray or yellowish lanate, with short translucent-scarious appendage at tip, coriaceous on maturity and falling with achenes, 1.5–2.0 mm long and 1–2 mm wide. Receptacle conical, glabrous. Florets tubular, small; peripheral florets pistillate, five to nine, fertile with filiform corolla fused with ovary; central florets bisexual, sterile, five, less often three, with five-fid corolla, ovary reduced, anthers at base with short filiform basal appendages; pappus absent. Leaves alternate, sessile, undivided, acuminate, oblong, lanceolate or oblongly linear, undulate or entire. Stems solitary or many, straight, spreading, dichotomously branched above. Annual plants, with dense, gray, sericeous-lanate, pubescence.

It is a Mediterranean genus comprising two species —*B. erecta* (L.) Smoljan. and *B. bombycinus* (Lag.) Smoljan. Earlier these species were referred by De Candolle to section *Bombycilaena* of genus *Micropus*, and the species *Micropus supinus* L., to section *Acantholaena* DC. However, the above-mentioned species are distinguished from *M. supinus* L. by alternate leaves, capitula aggregated in twos or threes in

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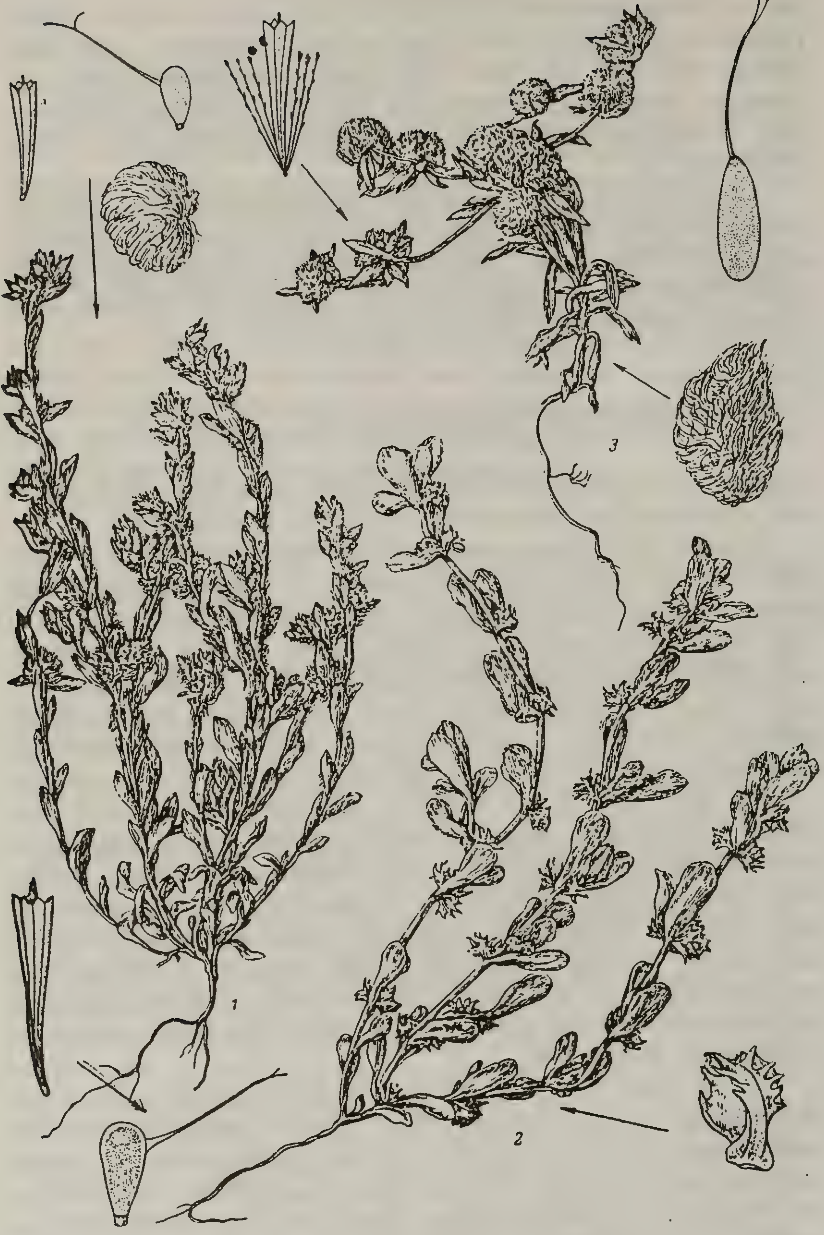
[1] Treatment by L.A. Smoljaninova.

[2] From the Greek words *bombyx*—round, and *laena*—scale.



303

Plate XVIII.
Habit; involucral bracts enclosing pistillate floret, bisexual floret:
1—*Bombycilaena erecta* (L.) Smoljan.; 2—*Micropus supinus* L.; 3—*Cymbolaena longifolia* (Boiss. and Reut.) Smoljan.

terminal or axillary globose heads, presence of bracteal leaves surrounding the inflorescence, basally herbaceous and pubescent outer involucral bracts and inner bracts enclosing the pistillate florets, dorsally smooth lanate and with short scarious appendages at the apex, turning coriaceous as achenes mature, and by number of pistillate (five to nine) and bisexual florets (five rarely three). The presence of the above-mentioned characters makes it possible to refer these species to the separate genus, which should most correctly be given the name *Bombycilaena*, the section name established by De Candolle. Because of the lateral fusion of its corolla to the ovary of the pistillate florets, *Bombycilaena* (DC.) Smoljan. is close to the genus *Micropus L.*

1. **B. erecta** (L.) Smoljan. comb. nova l.c. —*Micropus erectus* L. Sp. pl. (1763) 1313; Boiss. Fl. or. III (1875) 241; Grossh. Fl. Kavk. IV (1936) 99. —**Ic.**: Rchb. Ic. Fl. Germ. XVI, tab. 843, fig. 1.

305 Annual. Stems 5–20 cm high, solitary or many, straight, spreading, dichotomously branched above, short dense, appressed gray sericeous lanate. Leaves alternate, sessile, 10–15 mm long and 2–3 mm wide, oblong, oblong-lanceolate or linearly-lanceolate, acute, undulate, in both sides with heavy, gray tomentum; bracteal leaves 5 mm long, lanceolate, longer than inflorescence, gray-lanate. Capitula aggregated in small globose heads of two or three each, 6–8 mm (1.0–1.2 cm) wide, at tips and in forks of stems. Outer involucral bracts one-rowed, translucent-scarious, at base herbaceous, 1.5 mm long, oval, oblong-lanceolate or oblong-linear, acute, flat, glabrous inside, covered with long white hairs outside; inner involucral bracts enclosing pistillate florets, five to nine, 1.5–2.0 mm long and 1–2 mm wide, galeate, dorsally smooth, glabrous inside, with dense continuous gray-lanate pubescence of long hairs outside, with short translucent-scarious appendage at apex, coriaceous on maturity and falling with achenes. Peripheral florets pistillate, five to nine, with filiform corolla 1 mm long; style as long as tube, stigma bifid, with 0.3 mm long, filiform, glabrous, divergent lobes; ovary obovoid, 0.5 mm long and 0.3 mm wide, glabrous. Central florets bisexual, five, less often three, small, white with slightly reddish limb, corolla tubular, 1.2–1.3 mm long, in upper part 0.2 mm wide, style 1 mm long, stigma bifid, its lobes 0.2 mm long, lanceolate, more or less acuminate, compressed, papillate; ovary reduced, stamens attached at corolla base; anthers 0.5 mm long, syngenesious, surrounding the style, oblong, subacuminate, with short filiform, undivided, acuminate, basal appendages, filaments of stamens 0.5 mm long, flat, glabrous. Achenes small obovoid, flattened, smooth glabrous. Flowering IV–VII. (Plate XVIII, Fig. 1).

Dry, open, sandy and rocky places, rocks, dry trampled places. —*European Part*: Lower Don, Crimea; *Caucasus*: Ciscaucasia, Dagestan; western, eastern and southern Transcaucasia, Talysh. *General distribution*: Central Europe, eastern and western Mediterranean, Balkans-Asia Minor, Armenia and Kurdistan, Iran. Described from western Europe. Type in London.

GENUS 1484. **Cymbolaena** Smoljan.[1,2]

Smoljan. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, 17 (1955) 452

Capitula small, heterogamous, aggregated in terminal and axillary heads of 5–12, 1.3–1.5 cm wide. Bracteal leaves longer than 306 inflorescence, equal, or shorter. Outer involucral bracts one-rowed, thin, translucent-scarious, oval, glabrous, 1 mm long; inner bracts enclosing pistillate florets, three-rowed, 12–14, carinate, thin scaly, greenish, not hardened, 3.0–4.5 mm long and 1.0–1.5 mm wide, dorsally smooth, with dense snow-white or gray-lanate pubescence of long hairs, with translucent- scarious apical appendage, falling with mature achenes. Receptacle narrow, short, glabrous. Peripheral florets pistillate, 12–14, with filiform corolla, fertile, attachment of corolla to ovary almost apical or straight up. Central florets bisexual, sterile, three, with four-fid corolla; pappus of few caducous bristles; anthers with small, short, acute, entire, filiform appendages at the base. Achenes small, ovoid, glabrous. Leaves alternate, sessile, acuminate, linear. Stems solitary, often procumbent, dichotomously branched above, less often simple. Annual, densely gray-tomentose plants.

Monotypic genus.

In the pubescence of the inner involucral bracts and the presence at their tips of a translucent-scarious appendage, *Cymbolaena* is close to the genus *Bombycilaena* (DC.) Smoljan. in which the inner involucral bracts, unlike in *C. longifolia* (Boiss. and Reut.) Smoljan., are galeate and hardened.

1. **Cymbolaena longifolia** (Boiss. and Reut.) Smoljan. comb. nova l. c. —*Micropus longifolius* Boiss. and Reut. Fl. or. III (1875) 242.

Annual. Stem 1–15 cm high, solitary, often procumbent, dichotomously branched above, less often simple, with dense gray-tomentose pubescence. Leaves long, linear, flat, acuminate, strongly

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[1] Treatment by L.A. Smoljaninova.

[2] From the Greek words *cymba*—boat, and *laena*—scale.

gray-tomentose; bracteal leaves longer than inflorescence, as long or shorter. Capitula aggregated in globose heads of 15–12, 1.3–1.5 cm wide, at tips and in forks of stems. Outer involucral bracts one-rowed, thin, translucent-scarious, oval, glabrous, 1 mm long; inner bracts three-rowed, 12–14, carinate, thin, scarious, greenish, not coriaceous at maturity of achenes, 3.0–4.5 mm long and 1.0–1.5 mm wide, dorsally smooth, with dense snow-white or gray, lanate pubescence of long hairs, with translucent-scarious appendage at apex. Peripheral florets pistillate, 12–14, fertile; corolla filiform, 1.5 mm long, its attachment to the ovary almost apical or straight up; style as long as corolla tube; stigma bifid, exserted, stigma lobes filiform, 0.3 mm long, glabrous; ovary 1.5 mm long and 0.5 mm wide, ovoid, gibbous, glabrous. Central florets bisexual, sterile, three, white with reddish limb; corolla 1.5 mm
307 long,. four-fid; anthers 0.5 mm long, syngenesious, oblong, surrounding the style, apically obtuse, with small, short, acuminate, undivided filiform, basal appendages, glabrous, the filaments free, adhering, flat, glabrous, 1 mm long; style 1.5 mm long, stigma exserted from corolla tube, bifid, stigma lobes short, oblong, obtuse, erect, touching, flat, papillate; ovary reduced; pappus of few short (1–5 mm long), awned, caducous bristles. Achenes small, 1.5 mm long and 0.5 mm wide, smooth, glabrous. Flowering IV–VII. (Plate XVIII, Fig. 3).

Dry rocky slopes in middle mountain and subalpine zones. —*Caucasus*: Southern Transcaucasia; *Soviet Central Asia*: Mountainous Turkmenia, Syr-Darya, Pamiro-Alai, Tien Shan. *General distribution*: Eastern Mediterranean, Balkans-Asia Minor, Armenia and Kurdistan, Iran. Described from Asia Minor. Type in Geneva.

Note. Occurring throughout its range is its var. *evacina* Bornm. (Bornmüller Bearb. v. Knapp. im nord-westl. Persien gesammelten Pflanzen, 1909). —Stem 1–5 cm high, simple. Head solitary, sessile. Bracts as long as head or shorter. Iran, southern Transcaucasia, Soviet Central Asia.

GENUS 1485. **Evax** Gaertn. [1], [2]

Gaertn. De fruct. II (1791) 393, tab. 165; DC. Prodr. V, 458; Hoffm. in Pflzfam. IV, 5 (1894) 181

Capitula small, heterogamous, many-flowered, discoid, semiglobose or globose, aggregated two to five in compact umbels or heads, at tips of stems and branches and in forks of stem, enclosed by one row of bracteal leaves, forming a whorl or arranged irregularly. Involucre more or less two-rowed; involucral bracts appressed, translucent-scarious, scabrous, acuminate or obtuse. Receptacle conical or almost spherical, glabrous between bisexual florets, in remaining part with chaff and bearing pistillate florets, concave, aristate, acuminate or obtuse, membranous, dorsally lanate. Florets white or green, tubular; peripheral florets pistillate, many-whorled, filiform, with two- to four-fid corolla, sessile, each subtended by a pale but not enclosed, style glabrous, stigma bifid, with filiform lobes. Central florets bisexual, one to three, obconical, with four-fid limb, enclosed by one row of chaff; anthers with basal appendages, stigma bifid, stigma lobes erect, appressed. 308 Achenes small, obovoid or oblong, very rarely almost cylindrical, glandular-hairy or glabrous, without pappus. Leaves alternate, sessile. Low annual herbs or almost stemless plants; stems solitary or many, more or less densely white- or gray-lanate. Of the 26 species of this genus growing in southern Europe, northern Africa, Syria, Asia Minor, Iran, southern Transcaucasia and Central Asia, only five species are found in the USSR.

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[1] Treatment by L.A. Smoljaninova.

[2] Name of the plant from Pliny, derived from the name of the Arabian chieftain, a contemporary of Nero.

1. Bracteal leaves two times as long as heads............................2
+ Bracteal leaves slightly longer, as long as, or shorter than heads 3
2. Bracteal leaves recurved, radially arranged around head........ ....1. **E. anatolica** Boiss. and Heldr.
+ Bracteal leaves erect, appressed around head.............................. ....2. **E. contracta** Boiss.
3. Bracteal leaves somewhat longer than heads, plant procumbent, strongly branched; heads numerous, at tips of stems...................... ....3. **E. arenaria** Smoljan.
+ Bracteal leaves as long as or shorter than heads.....................4
4. Bracteal leaves erect, lying against heads; stems solitary, simple or branched from base, heads at tips of stems.............................. ....4. **E. micropodioides** Willk.
+ Bracteal leaves recurved; stems dichotomously branched; heads at tips and in forks of stems.......5. **E. filaginoides** Kar. and Kir.

Section 1. Euevax DC. Prodr. V. (1836) 458. —Phyllaries and pales aristate; bracteal leaves longer than capitula, forming involucre; capitula flat, aggregated in clusters of two or three in compact umbelliform inflorescence at stem tips.

1. **E. anatolica** Boiss. and Heldr. Diagn. ser. 1, 11 (1849) 2; Boiss. Fl. or. III, 243. —**Exs.**: Boiss. and Heldr. pl. Anat. exs. 1846.

Annual. Stem 2–4 cm high, usually simple, gray-lanate or glabrous. Leaves oblong or linearly lanceolate, 12–15 mm long and 2 mm wide, subacuminate, densely gray-lanate. Capitula flat, 0.6–1.0 cm wide, aggregated in clusters of two or three in compact umbelliform inflorescence at stem tip; bracteal leaves two to three times as long as capitula, lanceolate, acute, radially arranged to form involucre, strongly gray-lanate. Phyllaries and pales 2.5–3.0 mm long and 1 mm wide, thin, white, translucent-scarious, somewhat greenish in middle, oblong, 309 carinate, narrowed towards base, short cuspidate, glabrous inside, dorsally glabrous at base, but densely white-lanate in upper part. Receptacle flat, short. Pistillate florets with filiform corolla, 1.5 mm long; style as long as corolla tube; stigma bifid, lobes glabrous, filiform; ovary ovoid, 1 mm long and 0.3–0.4 mm wide, papillose. Bisexual florets narrow tubular, with corolla 1.3 mm long and 0.3 mm wide in upper part; ovary oblong-obovoid, 1.2 mm long and 0.3 mm wide, papillose. Achenes 1 mm long and 0.3 mm wide, ovoid, oblong or cylindrical, slightly flattened, somewhat strigose-scabrous brown. Flowering V. (Plate XIX, Fig. 2).

In middle zone, dry rocky places, rare. *Caucasus*: Southern Transcaucasia. *General distribution*: Mediterranean (eastern), Balkans-Asia Minor, Armenia and Kurdistan. Iran. Described from Asia Minor. Type in Geneva.

Note. This species was found in the USSR for the first time in southern Armenia (Alapars) by I.F. Khotsyatovskii in 1897 and later by Shchukin also in Armenia (Garni-arykh). In 1945, collections were made by Sh. Aslanyan and R. Karapetyan from dry slopes near the village of Dzhermuk (Aralagyoz).

2. **E. contracta** Boiss. Diagn. ser. 1, 11 (1849) 3–4.

Annual. Plant stemless, 2.5–4.0 cm high, gray-tomentose. Leaves 2.0–2.8 cm long and 0.5 cm wide, erect, appressed to capitulum, oblong or obovate-spatulate, tapered toward base into long, narrow petiole, mucronate, far exceeding heads, gray-tomentose. Capitula in compact, solitary, basal head, 1.0–1.5 cm long and 1–2 cm wide. Involucral bracts 3 mm long and 2 mm wide, concave, ovate or ovate-oblong, scarious, yellowish, whitish along margin; outer bracts with bristly cusp, inner acute, weakly pubescent only dorsally in upper part. Achenes ovoid, flattened, weakly ribbed, 1 mm long and 0.75 mm wide, canescent and with fine bristles. Flowering V.

Calcareous soils, dry stony places. —*Caucasus*: Eastern Transcaucasia. *General distribution*: Eastern Mediterranean (Syria, Palestine), Iran. Described from Palestine. Type in Geneva.

Note. This species was discovered by I.I. Karjagin in the 1947 collections of an unknown collector from northeast of Surakhans on Apsheron.

Section 2. EVACELLA Smoljan. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVIII (1957) 269. —Involucral bracts and outer pales carinate, acute, without subulate point, dorsally with dense white-lanate pubescence to base, inner pales subacuminate. Receptacle conical. Bracteal leaves slightly exceeding heads. Capitula aggregated in clusters of 3–5 in semiglobose terminal heads.

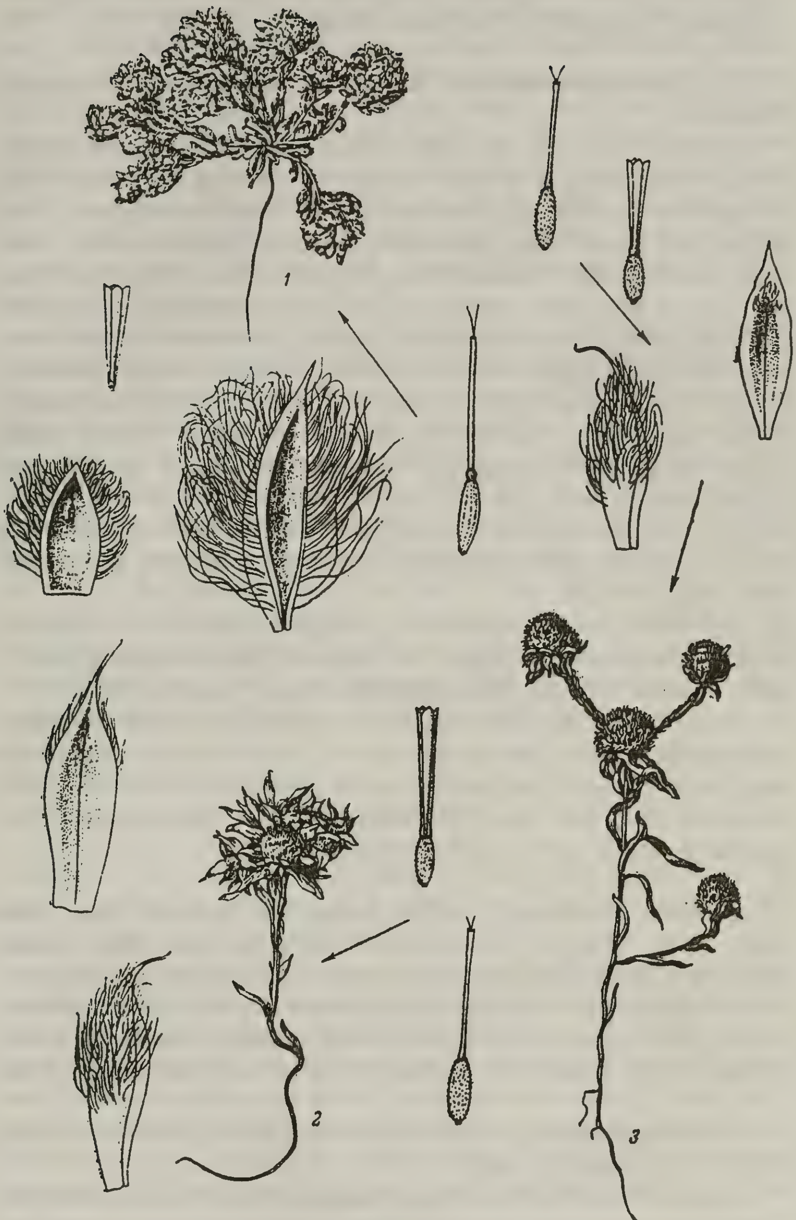
3. **E. arenaria** Smoljan. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVIII (1957) 270.

Annual. Plants 1–4 cm high; stems many or solitary, prostrate or ascending, densely gray-tomentose; plants sometimes stemless. Leaves 6.0–7.5 mm long and 1.5–2.0 mm wide, oblong-spatulate, taper from middle to base, at tip rounded, short-acuminate, with both sides densely gray-tomentose; bracteal leaves 7 mm long and 1 mm wide, oblong-lanceolate, slightly longer than heads, lying against them, densely tomentose. Capitula aggregated in clusters of three to five in semiglobose terminal heads. Involucral bracts and outer pales enclosing pistillate florets 3–4 mm long and 1.0–1.5 mm wide, carinate, concave, in middle greenish, along margin translucent-scarious, white, acute, without subulate point, dorsally to base with dense white-lanate pubescence of long hairs; inner pales lying against bisexual florets, 2.0–2.5 mm long and 1 mm wide, slightly concave, broad-lanceolate, short-acuminate, in middle greenish, dorsally with sparse long white hairs. Receptacle conical. Pistillate florets filiform, 1.5 mm long, white; bisexual florets three or four, white, 1.5 mm long, with narrow corolla tube; ovary highly reduced. Achenes ovoid, 1 mm long and 0.5 mm wide, finely strigose. Flowering VI. (Plate XIX, Fig. 1).

Sandy steppe, edges of sands in hollows. —*Soviet Central Asia*: Kyzyl-Kum. Endemic. Described from southwest Kyzyl-Kum, the village of Adymbai. Type in Leningrad.

Note. In the shape of the outer involucral bracts, this species is closer to *E. micropodioides* Willk. from which it is distinguished by short-acuminate inner pales and smaller bisexual florets (1.5 mm long) with a reduced ovary.

Section 3. PSEUDEVAX DC. Prodr. V (1836) 459. —Outer involucral
313 bracts lanate pubescent, inner bracts and pales oblong, scarious, obtuse.
Capitula lax or aggregated, enclosed in leafy bracts; bracteal leaves



311 Plate XIX.

Habit; outer pale; inner pale; bisexual floret; pistillate floret:
1—*Evax arenaria* Smoljan.; 2—*E. anatolica* Boiss. and Heldr.; 3—*E. filaginoides* Kar. and Kir.

longer than capitula, irregularly arranged around them. In habit the plants are similar to members of the genus *Filago*.

4. **E. micropodioides** Willk. in Willk. and Lange, Prodr. Fl. Hisp. II (1870) 65.

Annual. Plant 2–5 cm high, densely tomentose. Stems simple; solitary or branching from base. Leaves 5–6 mm long and 2 mm wide, oblong-lanceolate, strongly pubescent; bracteal leaves broadly oval, erect, as long as or shorter than heads, gray-tomentose. Heads globose, 1 cm long, solitary at tips of stems. Outer involucral bracts 3.0–3.5 mm long and 1.0–1.5 mm wide, oblong, concave, short-acuminate, in middle greenish, along margin scarious, dorsally pubescent; inner bracts and pales lying against bisexual florets, subobtuse, weakly concave. Pistillate florets with filiform corolla, 2 mm long; style as long as corolla tube; stigma exserted from corolla tube, bifid, lobes of stigma 0.3 mm long, filiform, slightly spreading; ovary 1.0–1.5 mm long and 0.5 mm wide, obovoid, finely strigose. Bisexual florets with broader tube, 2.5–3.0 mm long and 0.25 mm wide; ovary reduced—0.5 mm long and 0.2 mm wide, glabrous. Achenes obovoid, 1.5 mm long and 0.5 mm wide, finely strigose.

Dry stony places, limestones, at 1,300–1,400 m. —*Caucasus*: Eastern Transcaucasia. *General distribution*: Mediterranean (Spain—Sierra Nevada, Greece). Described from Spain. Type in Berlin.

Note. This species was collected in 1898 by B. Levandovskii from Azerbaidzhan (Baku District, Belyasuvar). On the basis of the obtuse inner involucral bracts and pales it can be tentatively included in section *Pseudevax* DC., from whose representatives it is distinguished by the bracteal leaves as well as outer involucral bracts.

Section 4. Filaginoides Smoljan. in Bot. Mat. Bot. Inst. Akad. Nauk SSSR, XVIII (1957) 273. —Involucral bracts and outer pales carinate, with long bent or straight tip, with dense white-lanate pubescence dorsally in upper part; inner pales acuminate. Receptacle almost globose; bracteal leaves shorter or almost as long as head, recurved. Capitula aggregated in globose heads, solitary at tips of stems and in their forks.

5. **E. filaginoides** Kar. and Kir. in Bull. Soc. Nat. Mosc. XV (1842) 379; Ldb. Fl. Ross. II, 499.

Annual. Stem 4–13 cm high, straight, simple, dichotomously branched above, with gray pubescence. Leaves 12–18 mm long and 2.0–2.5 mm wide, linear, subacuminate, strongly gray-lanate. Capitula
314 in globose heads 0.8–1.0 cm wide, solitary, at tips of branches and in forks of stems. Bracteal leaves slightly shorter than or as long as heads,

recurved, lanceolate, acuminate, pubescent. Involucral bracts and outer pales 3 mm long and 1 mm wide, translucent-scarious, carinate, concave, with white membranous, bent or straight, 1 mm long tip, glabrous inside, dorsally in upper part with dense lanate; pubescence of long, white hairs; inner pales acute; receptacle more or less globose. Pistillate florets with filiform corolla, 1.5–1.75 mm long and 0.5 mm wide; ovary 1 mm long and 0.3–0.5 mm wide, ovoid, papillose; bisexual florets with 1.3–1.5 mm long corolla, 0.3 mm wide in upper part; ovary obovoid, 0.75–1.0 mm long and 0.3 mm wide, papillose. Achenes small, 1 mm long and 0.3–0.5 mm wide, ovoid, light brown, strigose. Flowering VII–VIII. (Plate XIX, Fig. 3).

River valleys, along shores of lakes, sandy areas and clayey soils. —*European Part*: Lower Volga; *Soviet Central Asia*: Kyzyl-Kum, Aralo-Caspian, Syr-Darya, Amu-Darya, Kara-Kum, Balkhash Region, Tien Shan. Endemic. Described from the Ayaguz River. Type in Leningrad.

Note. In the beginning *E. filaginoides* was tentatively included by Karelin and Kirilow and later by De Candolle in the section *Euevax*. An examination of this species showed that it differs sharply from the representatives of the genus *Evax* by having solitary, terminal heads on the tips of the branches and in the forks of the stem, recurved bracteal leaves, involucral bracts and pales with a bent tip, and a globose receptacle and in habit. This provides the basis to consider it a member of a separate monotypic section of the genus *Evax*, *Filaginoides*, because of its morphological similarity to *Filago germanica* L.

GENUS 1486. **Filago** L.[1, 2]

L. Sp. pl. (1753) 927; Ldb. Fl. Ross. II (1844) 615; Boiss. Fl. or. III, 245; O. Hoffm. in Pflzfam. IV, 5 (1894) 181. —*Gifola, Oglifa, Logfia* Cass. in Bull. Soc. Phil. (1819) 247

Capitula small. Heterogamous, many- or few-flowered, pentagonal, pyramidal or ovoid aggregated in compact globose, semiglobose, or ovoid heads, or in corymbiform inflorescences, very rarely solitary; heads or corymbiform inflorescences few or numerous, at tips of branches and in forks of stems or at tips of branches, and in axils of upper leaves, and then forming almost spicate, paniculate, or racemose inflorescences.
315 Involucre two- to five-rowed; bracts imbricate or opposite, scarious (in some species involucral bracts coriaceous at base, hardened); outer

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[1] Treatment by L.A. Smoljaninova.

[2] From the Latin word *filum*—thread (so named bacause of the slender hairs covering the plant).

bracts carinate, dorsally strongly lanate; inner ones straight or somewhat concave, weakly pubescent or glabrous. Receptacle rounded, flat, or elongated, glabrous, tuberculate-pitted. Peripheral florets of capitulum pistillate, 2–3 mm long, numerous, fertile, filiform-tubular, with two- or three-toothed corolla, each floret surrounded or subtended by pales; stigma lobes filiform. Central florets bisexual, free, two to seven, tubular, four-fid, mostly sterile, 1.5–3.0 mm long; anthers with basal appendages; stigma bifid, stigma branches oblong or linear, obtuse, papillose. Pappus of bisexual and pistillate inner florets one-rowed, of few, less often numerous, slender, brittle, caducous, barbed bristles; pappus of outer pistillate florets one-rowed, of few bristles, or absent. Achenes small, ovoid or oblong-ovoid, somewhat flattened, smooth, glabrous, with fine membranous papillae. Annual low herbs, usually densely lanate or tomentose with whitish, gray or yellowish pubescence with alternate, undivided, lanceolate, linear or spatulate leaves.

The genus comprises 37 species growing in Europe, Asia Minor, northern Africa, the Caucasus, Iran, and Soviet Central Asia. Within the USSR, seven species of this genus belonging to three different sections are found.

1. Involucral bracts with long subulate, acuminate tips, not spreading in fruits, three- to five-rowed, capitula in heads of 10–30, at tips of branches and in forks of stems....................................2

+ Involucral bracts bluntish or acute, in fruits stellately spreading, two- or three-rowed; capitula in dense heads of 2–10, at tips of branches and in axils of upper leaves, forming more or less spicate, racemose or paniculate inflorescences, or in corymbiform inflorescences of two to five capitula.....................................5

2. Bracteal leaves shorter than heads, erect.....................................3

+ Bracteal leaves longer than heads...4

3. Heads spherical; leaves acuminate, sparse, somewhat spreading from stem, strongly tomentose; stem dichotomously branched from middle...1. **F. germanica** L.

+ Heads ovoid; leaves acute, dense, appressed to stem, with dense, continuous, gray pubescence; stem usually dichotomously branched in upper part.............................2. **F. eriocephala** Guss.

4. Bracteal leaves one and one-half to two times as long as heads, whorled; heads hemispherical; leaves lanceolate-spatulate, abruptly broadened from middle to upper part, few...3. **F. bornmulleri** Hausskn.

316 + Bracteal leaves slightly longer than heads; heads more or less spherical; leaves oblong-spatulate, gradually narrowed to base, numerous..4. **F. spathulata** Presl.

5. Involucral bracts without keel; stem paniculately branched or simple..........6
+ Involucral bracts carinate; stem dichotomously branched.........8
6. Stems several or solitary, paniculately branched, less often simple; capitula 2–3 mm long, in numerous heads of 2–10 at tips of branches and in axils of upper leaves, forming more or less racemose or paniculate, less often spicate inflorescences..........5. **F. arvensis** L.
+ Stem solitary, simple, capitula 4–5 mm long, in few heads of two to five, discontinuously distributed in upper part of stem and forming spicate inflorescence..........7.
7. Plant with strong light gray or snow-white lanate pubescence; involucral bracts acuminate, outer white-flocculose-lanate, inner weakly pubescent or glabrous..........6. **F. montana** L.
+ Plant with dense, gray, lanate pubescence; outer involucral bracts acuminate, yellowish-flocculose-lanate, inner acuminate or bluntish, glabrous..........7. **F. lagopus** Parl.
8. Involucral bracts weakly gibbous at base; bracteal leaves shorter than inflorescence; leaves lanceolate......8. **F. minima** (Sm.) Pers.
+ Involucral bracts strongly gibbous at base; bracteal leaves greatly exceed inflorescence; leaves linearly subulate.....9. **F. gallica** L.

Section 1. GIFOLA (Cass.) DC. Prodr. VI, 247. —*Gifola* Cass. in Bull. Soc. Phil. (1819) 143, Gen. —Capitula almost pentagonal, several, in compact spherical, hemispherical or ovoid heads, at tips of branches and in forks of stem; involucral bracts three- to five-rowed, subopposite, long subulate-acuminate, erect after anthesis; receptacle cylindrical; pappus absent in outer pistillate florets, but present in inner pistillate and bisexual florets, consisting of a few bristles.

1. **F. germanica** L. Sp. pl. (1763) 1311; DC. Prodr. VI, 247; Ldb. Fl. Ross. II, 616; Sorn. Rast. SSSR, IV, 205. —*Gifola germanica* Cass. l.c. —**Ic.**: Rchb. Ic. Fl. Germ. XVI, tab. 54, fig. 1.—**Exs.**: Fl. exs. Austro-Hung, No. 980.

Annual. Stems 5–50 cm high, solitary, very rarely several, erect or ascending, dichotomously branched from middle, densely gray or 317 yellowish lanate-tomentose. Leaves upright, few, 1.5–1.7 cm long and 3–4 mm wide, lanceolate or oblong-lanceolate, undulate margin, acuminate, densely grayish-tomentose. Capitula 5 mm long, obtusely pentagonal-conical, in compact globose heads of 20–30, 6–14 mm wide, in forks of stem and at tips of branches. Bracteal leaves oblong-lanceolate or narrowly lanceolate, erect, shorter than inflorescence. Involucre five-rowed; outer involucral bracts 4.0–4.5 mm long and 1 mm wide, with greenish keel, straw-yellow, with long, thin, subulate point, dorsally with dense lanate pubescence up to middle, glabrous at tip; inner bracts 3 mm long, broadly lanceolate or lanceolate, slightly concave, scarious, straw-yellow, in middle greenish, at tip often reddish, acuminate. Bisexual florets two. Achenes oblong or ovoid, 0.5–0.8 mm long and 0.1–0.2 mm wide, brown, glabrous, outer achenes without pappus, inner with pappus of 16–24 bristles. Flowering V–VIII.

Dry sandy and stony places, rocks, as weed in crops, waste places; in coastal belt as well as in foothill zone up to 600 m. —*European Part*: Upper Dnieper, Middle Dnieper, Black Sea Region, Crimea, Lower Don; *Caucasus*: All regions; *Soviet Central Asia*: mountainous Turkmenia, Pamiro-Alai. *General distribution*: Southern and central Europe, northern Africa, Balkans-Asia Minor, Iran. Described from Europe. Type in London.

Note. Two varieties of this species are found throughout its range:

1) var. *lutescens* (Jord.) Gren. and Godr. —Plant yellowish-gray-tomentose; stem usually branched almost from base; involucral bracts straw-yellow, outer ones strongly tomentose, inner glabrous, often with reddish cusp; rare.

2) var. *canescens* (Jord.) Gren. and Godr. —Plant densely gray-tomentose; stem branched only in upper half, branches more spreading; heads smaller, of 16–20 capitula; involucral bracts yellowish, outer ones gray-tomentose, inner almost white, glabrous. Widely distributed throughout the range of the species.

2. **F. eriocephala** Guss. Plant. rar. (1826) 344. —*F. germanica* var. *lanuginosa* DC. Prodr. VI (1837) 247. —*F. germanica* var. *eriocephala* Boiss. Fl. or. III (1875) 245. —**Ic.**: Guss. op. cit. tab. 69; Jord. Obs. fragm. III (1846), tab. 7c. —**Exs.**: Herb. Graecum norm. No. 880.

Annual. Stems 10–15 cm high, erect, rigid, solitary or few, dichotomously branched at tip, densely gray lanate-tomentose. Leaves numerous, appressed to stem, upright, 10–20 mm long 2–8 mm wide, narrowly lanceolate, or linearly lanceolate, acuminate, on both sides densely light-gray lanate-tomentose. Capitula pyramidal, in compact
318 ovoid heads of 20–30, in forks of stem and at tips of branches; bracteal leaves shorter than inflorescence. Involucre five-rowed; outer bracts 4 mm long and 1 mm wide, lanceolate, concave, scarious, lustrous, light yellow, greenish in middle upward, acuminate with straight or slightly bent tip, dorsally with long, whitish-lanate pubescence, to almost three-fourths of length; inner bracts lanceolate or broadly lanceolate, acuminate, or with sharp point, flat, 3.5–4.0 mm long and 1 mm wide, light yellow, membranous, lustrous, glabrous. Bisexual florets two; inner pistillate florets and bisexual florets with pappus of 12–14 bristles. Achenes

oblong-ovoid, 0.5–0.8 mm long, with sparse papillae. Flowering V–VII. (Plate XX, Fig. 1).

Dry sandy places, in foothill zone. —*European Part*: Crimea; *Caucasus*: All regions. *General distribution*: Mediterranean, Balkans-Asia Minor, Armenia and Kurdistan, Iran. Described from western Europe. Type in Paris.

3. **F. bornmulleri** Hausskn. in Fedde, Repert. XVIII (1922) 40; Parsa. Fl. Iran III, 214.

Annual. Stems 5–10 cm high, solitary or three to five, simple or dichotomously branched, slender, reddish, dark gray tomentose. Leaves few, sparse, 1–2 cm long and 1.5–2.0 mm wide, lanceolate-spatulate, obtuse or subacuminate, abruptly widened from middle, gray-lanate, more pronounced beneath; bracteal leaves 1.2–2.0 cm long, spatulate, whorled, one and one-half to two times as long as heads. Capitula pentagonal, light yellow, in hemispherical heads of 8–15, 8–9 mm long and 10–14 mm wide; heads solitary or three to five. Involucral bracts three-rowed, outer ones oblong-lanceolate, carinate 4.5–5.0 mm long and 1 mm wide, along margin translucent-scarious, subulate-acuminate, dorsally weakly pubescent in upper part; inner bracts 3–5 mm long, somewhat concave, lanceolate, broadly lanceolate or oblong-ovate, with short point (innermost bracts acuminate), almost glabrous, greenish in middle, along margin white-membranous. Bisexual florets four. Pappus absent in outer pistillate florets, in inner pistillate florets, of 6–10 bristles, in bisexual florets of 16–20 bristles; bristles more coarsely barbed than in other species of the genus. Achenes obovoid, 1 mm long and 0.5 mm wide, with sparse papillae. Flowering IV–VI.

Rocky slopes, middle montane zone. —*Soviet Central Asia*: Kara-Kum, Pamiro-Alai. *General distribution*: Iran. Described from Iran.

321 4. **F. spathulata** Presl. Delic. Prag. I (1822) 93; Boiss. Fl. or. III, 246; Grossh. Fl. Kavk. IV, 100; Sornye Rast. SSSR, IV, 206. —*F. germanica* var. *spathulata* (Presl.) DC. Prodr. VI (1837) 247. —**Ic.**: Jord. Obs. pl. Fr. fragm. 3 (1846) 199, tab. 7, f.c. —**Exs.**: Flk. Gall. et Germ. exs. No. 37.

Annual. Stems 5–80 cm high, usually branched from base, branches erect or ascending, often somewhat flexuous, dichotomously branched at tip, canescent. Leaves thin, 1.5–2.0 cm long and 4–6 mm wide, oblong-spatulate, narrowed to base, obtuse or short-acuminate, on both sides with long, appressed, gray tomentose pubescence, sparse. Capitula 5 mm long, ovoid, in compact more or less globose heads of 10–15, 6–12 mm wide, in forks of stem and at tips of branches. Bracteal leaves spreading, slightly longer than heads. Involucre five-rowed, outer bracts lanceolate, carinate, 5.0–5.5 mm long and 1 mm wide with straight or slightly recurved, slender subulate, acuminate tip, dorsally strongly light gray-lanate with long hairs; inner bracts 4.0–4.5 mm long, broadly lanceolate, flat, scarious, becoming green in middle, along margin membranous, white, long-acuminate; innermost bracts lanceolate, short-acuminate or oblong-ovate and blunted, flat, membranous, white, glabrous. Bisexual florets 5–7. Achenes 0.5–0.8 mm long and 0.2–0.4 mm wide, oblong-obovoid, glabrous, finely papillose, outer achenes without pappus, inner with pappus of several bristles; pappus of bisexual florets with 12–14 bristles. Flowering: IV–VI. (Plate XX, Fig. 3).

Dry sunny, sandy and stony places, fields, along roads, weed-infested places. —*Caucasus*: Southern and eastern Transcaucasia, Talysh; *Soviet Central Asia*: mountainous Turkmenia, Syr-Darya, Pamiro-Alai (west), Tien Shan. *General distribution*: Central Europe, western and eastern Mediterranean, Balkans-Asia Minor, Armenia and Kurdistan, Iran. Described from western Europe. Type in Prague.

Note. In southern and eastern Transcaucasia and Pamiro-Alai, a variety of this species, var. *prostrata* (Parlat.) Boiss., is found, which is distinguished by the following characters: plants low; stems many, procumbent, ascending above, strongly branched from base; heads smaller, numerous, tightly surrounded by bracteal leaves; leaves small, elliptical or almost rotund, acuminate.

Section 2. OGLIFA (Cass.) DC. Prodr. VI, 248. —*Oglifa* Cass. in Bull. Soc. Philom. (1819) 143, gen. —Capitula pyramidal or ovoid in compact heads of 2–10, at tips of stems and branches, in forks of stems, and in axils of upper leaves forming almost paniculate, racemose or 322 spicate inflorescences, very rarely solitary. Receptacle short, flat, round. Involucral bracts two- or three-rowed, alternate, after flowering stellately spreading. Pappus of pistillate and bisexual florets of few bristles.

5. **F. arvensis** L. Sp. pl. (1763) 1312; DC. Prodr. VI, 248; Ldb. Fl. Ross. II, 617; Kryl. Fl. Zap. Sib. XI, 2692; Grossh. Fl. Kavk. IV, 100. —*Gnaphalium arvense* Willd. Sp. pl. III, 3 (1800) 1897. —**Ic.**: Rchb. Ic. Fl. Germ. XVI, tab. 946, fig. 2. —**Exs.**: GRF 770.

Annual. Stem 5–35 cm high, erect, paniculately branched, less often simple, sometimes dichotomously branched above, densely whitish- or grayish-lanate. Leaves lanceolate, or linearly lanceolate, 5–15 mm long and 1.3 mm wide, acute, with soft lanate pubescence. Capitula 2–3 mm long, ovoid or pyramidal, in numerous heads of 2–10, terminal on stems and branches, forming paniculate, racemose, or less often spicate, inflorescences; bracteal leaves shorter than or as long as capitula. Involucre two- or three-rowed, bracts stellately spreading on maturity of achenes;

outer involucral bracts 5–10, linear or lanceolate, boat-shaped, without keel, subacuminate, 2–3 mm long, tightly enclosing pistillate florets, green in middle, along margin scarious-white membranous, dorsally with dense, uniform gray-lanate pubescence, glabrous at tip; inner bracts five, broad lanceolate, slightly concave, acute or blunted, greenish in middle along margin white, dorsally weakly pubescent or glabrous. Achenes oblong-ovoid, somewhat compressed, light brown, 0.8–1.0 mm long and 0.3 mm wide, glabrous, with sparse larger papillae than in other species of the genus; pappus of pistillate and bisexual florets of 12–14 finely-barbed bristles. Flowering V–VIII. (Plate XX, Fig. 2).

Pine forests and along their edges, sandy places, dry slopes, old fields, less often on stony places, steppe meadows, near roads, from the coast to 1,300 m. —*European Part*: All regions excluding Karelia-Lapland; *Caucasus*: All regions; *Western Siberia*: Ob River Area, Altai; *Soviet Central Asia*: All regions. *General distribution*: Almost all Europe excluding northern Scandinavia and England, eastern and western Mediterranean, Balkans-Asia Minor, Armenia and Kurdistan, Iran, Tibet, northwestern Mongolia. Described from western Europe. Type in London.

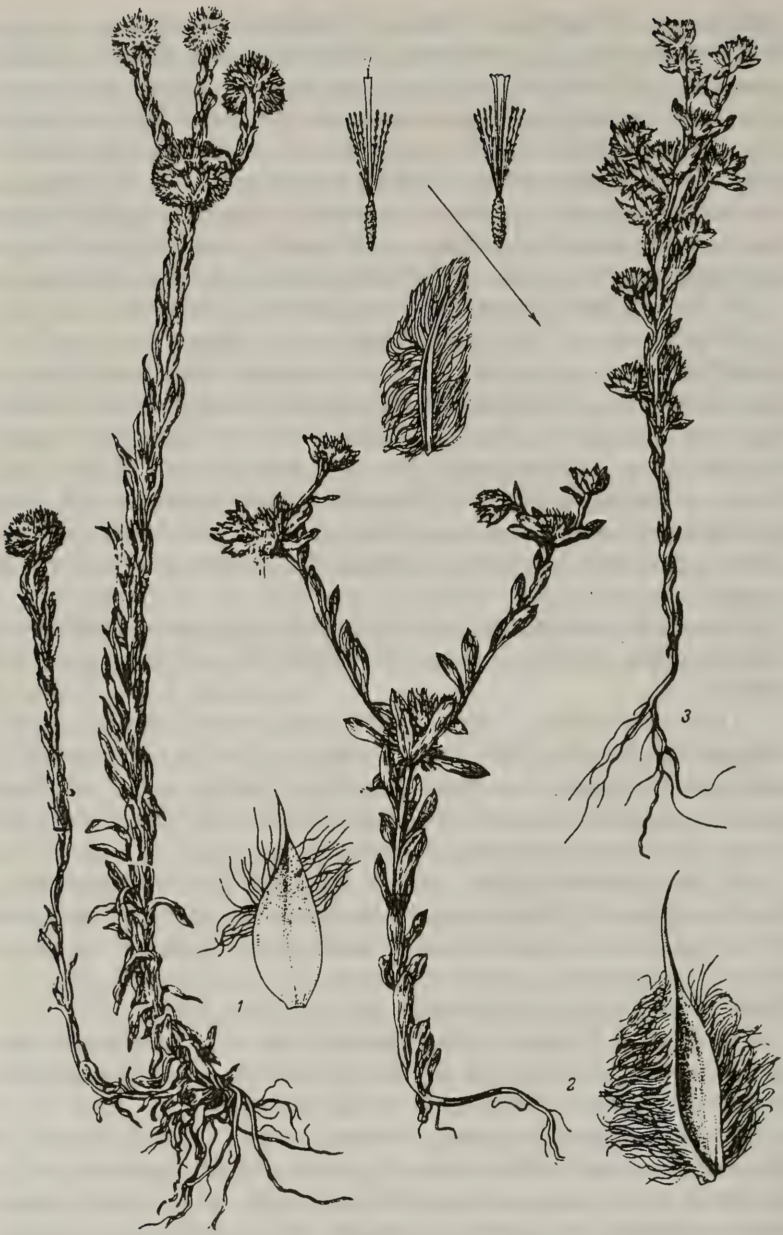
Note. It is a polymorphic species treated by me in the broad sense and requiring further studies. The following varieties are well marked:

1) var. *ramosa* Rouy. —Stems solitary or few, usually strongly branched from middle, branches often dichotomously branched at tips; capitula in numerous heads of 5–10, at tips of branches as well as in forks of stems, forming paniculate, racemose or spicate inflorescence; plants with copious grayish-white pubescence; frequent.

323 2) var. *subsimplex* Rouy. —Stems 5–15 cm high, solitary, simple, erect; capitula 2.0–2.5 mm long, in compact heads of 3–10, heads two to four (or solitary), terminal; leaves small, dense; appressed; all plants densely grayish-white pubescent; bracteal leaves shorter than capitula; found in sandy places, in cut-over areas and pine forests.

3) var. *laxa* Lindem. —Stem simple, flexuous; inflorescences few, sparse, in axils of leaves and at tips of stems; leaves sparse, narrowly lanceolate; plants with light gray pubescence; rare.

4) var. *sylvestris* Lindem. —Stems usually solitary, simple or branched from base; inflorescences larger, in axils of leaves and at tips of stems; leaves large, spatulate; bracteal leaves longer than inflorescence; all plants with continuous, grayish-white, tomentose pubescence. A form of moist habitats, found in sandy places along banks of rivers and lakes; rare.



319 Plate XX.

1—*Filago eriocephala* Guss., habit, outer involucral bract; 2—*F. arvensis* L., habit, outer involucral bract, pistillate floret, bisexual floret; 3—*F. spathulata* Presl., habit, outer involucral bract.

6. **F. montana** L. Sp. pl. (1763) 1311. —*Gnaphalium montanum* Willd. Sp. pl. III, 3 (1800) 1896. —*Xerotium montanum* Bluff and Fingerhuth, Comp. Fl. Germ. II (1825) 344.

Annual. Stems 6–15 cm high, slender, erect, usually solitary, simple, sometimes dichotomously branched above, all plants with dense, appressed light gray or snow-white tomentum. Leaves 6–10 mm long and 1.5–2.0 mm wide, linear or linearly lanceolate, subacuminate, appressed to stem, on both sides with heavy, appressed, gray tomentum. Capitula 4–5 mm long, ovoid or conical, in few compact, sessile, globose heads of three to five (sometimes one or two); heads solitary or in twos at tip of stem or 5–14 in axils of upper leaves forming interrupted, spicate inflorescence. Involucre three-rowed, outer involucral bracts 10, linear, carinate, green in middle, along margin translucent-scarious, 2–3 mm long and 0.5 mm wide, acuminate or short-aristate, dorsally with dense light gray or snow-white flocculose tomentum; inner bracts 3 mm long and 0.8–1.0 mm wide flat, broadly lanceolate, subacuminate, basally somewhat broadened, thin, scarious, white-membranous, glabrous or with sparse pubescence, lustrous. Bisexual florets three. Achenes 1 mm long and 0.3–0.5 mm wide, narrowly ovoid, glabrous, with fine, sparse papillae; pappus of inner pistillate and bisexual florets of 12–16, closely long-barbed bristles. Flowering VII–IX.

Dry stony places in montane regions. —*Caucasus*: Eastern and southern Transcaucasia; *Soviet Central Asia*: Tien Shan (west). *General distribution*: Western Europe, Balkans-Asia Minor, Iran. Described from western Europe. Type in London.

7. **F. lagopus** Parl. Pl. novae (1842) 13. —*Gnaphalium lagopus* Steph. in Willd. Sp. pl. III, 3 (1800) 1897. —*F. arvensis* var. *lagopus*
324 DC. Prodr. VI (1836) 248. —*F. arvensis* var. *lagopus* Ldb. Fl. Ross. II, 1 (1844) 617.

Stem erect, simple, sometimes dichotomously branched above, densely gray-tomentose. Leaves 10–17 mm long and 3–4 mm wide, oblong or linear, upper ones lanceolate, on both sides with continuous, appressed gray-tomentum, appressed to stem, crowded. Capitula 4–5 mm long broadly ovoid or almost globose, in few compact spherical heads of two to five (often one) at tips of stems or branches and in axils of upper leaves, forming spicate inflorescences; bracteal leaves slightly longer than heads. Involucre two- or three-rowed; outer bracts five to eight, carinate, linear, 3.0–3.5 mm long and 1.0–1.3 mm wide, acuminate, along margin scarious, white-membranous, inside greenish, dorsally densely yellowish flocculose-tomentose; inner bracts five, broadly lanceolate or ovate, somewhat concave, basally often with small lobes, scarious, greenish in middle, along margin white-membranous, subacuminate or obtuse, dorsally very weakly lanate or glabrous. Bisexual florets three or four. Pappus absent in outer pistillate florets, in inner pistillate and bisexual florets of 12–16, closely and finely barbed bristles. Achenes 0.5–0.8 mm long and 0.2–0.3 mm wide, narrow-ovoid, light brown, with sparse, fine papillae and glandular hairs. Flowering V–VIII.

Stony places, in montane regions. *Caucasus*: Southern Transcaucasia; *Soviet Central Asia*: Pamiro-Alai. *General distribution*: Eastern and western Mediterranean, Balkans-Asia Minor, Iran. Described from western Europe. Type in London.

8. **F. minima** (Sm.) Pers. Syn. pl. II (1807) 422; Fries Novit. Fl. Suec. ed. 2 (1828) 268. —*F. montana* L. Sp. pl. (1763) 1312, p. p. —*Gnaphalium minimum* Smith, Fl. brit. II (1800) 873; Willd. Sp. pl. III, 3 (1800) 1896. —*Oglifa minima* Rchb. Ic. Fl. Germ. XVI (1854) tab. 946, fig. II. —**Ic.**: Rchb. ibid. —**Exs.**: Fl. germ. exs. No. 2035; Fl. Boh. et Morav, exs. No. 494; GRF No. 114.

Annual. Stems 4–30 cm high, solitary or several, slender, erect, dichotomously branched at tips, with gray arachnoid-tomentose pubescence. Leaves 4 mm long and 1 mm wide, numerous, flat, appressed to stem, lanceolate or linearly lanceolate, acute, entire, on both sides dense, appressed, gray lanate-tomentose pubescence. Capitula 3 mm long and 2 mm wide, ovoid or pyramidal, in clusters of three to five in subcorymbose inflorescences in forks of stem and at tips of branches; bracteal leaves shorter than capitula. Involucre two- or three-rowed; 325 outer bracts 6–13, with keel, at base weakly gibbous, lanceolate or ovate, blunted, 2.5–3.0 mm long and 0.5 mm wide, in middle herbaceous, along margin translucent-scarious, lustrous, straw-yellow, dorsally, at base only, densely tomentose, at apex and inside glabrous; inner bracts five or six, narrowly lanceolate, flat or slightly concave, acuminate, 2 mm long and 0.3 mm wide, scarious, glabrous, lustrous, in middle greenish, along margin white-membranous. Bisexual florets four, with pappus of 20–24 bristles. Achenes 0.8–1.0 mm long and 0.3–0.5 mm wide, ovoid or oblong-ovoid, brown, glabrous, with sparse papillae; pappus of inner achenes of 20–24 very small, scabrous-barbed bristles. Flowering VI–VIII.

Occasionally in waste places, pastures, fallow fields, dry sandy places, along edges of pine-forests. —*European Part*: Ladoga-Ilmen, Upper Volga, Volga-Kama, Volga-Don, Upper Dnieper, Middle Dnieper, Upper Dniester. *General distribution*: Scandinavia, Atlantic and central Europe, western Mediterranean, Balkans-Asia Minor. Described from western Europe. Type in England.

Section 3. Logfia Boiss. Fl. or. III, 248. —*Logfia* Cass. in Bull. Soc. Phil. (1819) 247, gen. —Capitula small, clustered two to five in subcorymbose inflorescences, in forks of stem and at tips of branches, surrounded by bracteal leaves longer than inflorescence. Involucral bracts three-rowed, opposite, obtuse; outer bracts at base strongly gibbous, stiff, along the margin scarious, erect after anthesis. Receptacle short, flat, rotund. Peripheral pistillate florets without pappus, inner pistillate and bisexual florets with pappus of few bristles.

9. **F. gallica** L. Sp. pl. (1763) 1312; Boiss. Fl. or. III, 248; Grossh. Fl. Kavk. IV, 100; Fl. Gruzii, VIII, 258.—*Logfia subulata* Cass. in Dict. Sc. nat. 27 (1823) 116.—**Ic.**: Rchb. Ic. Fl. Germ. XVI (1854) tab. 947.—**Exs.**: Fl. Gall. et Germ. exs. No. 84.

Annual. Stems slender, erect, 5–30 cm high, solitary or many, dichotomously branched at apex, appressed grayish-tomentose. Leaves 8–9 mm long and 0.5–1.0 mm wide, linear or linearly subulate, entire, acute, margins rolled, upright, appressed to stem, with fine, gray, almost sericeous pubescence; bracteal leaves twice as long as inflorescence. Capitula 4 mm long, pentagonal-ovoid-conical, in corymbose inflorescences of two to five, in forks of stem and at tips of branches. Involucre three-rowed, bracts opposite; outer bracts eight, two-rowed, with keel, coriaceous, at base strongly gibbous, 3.0–3.5 mm long and 1 mm wide, bluntish and shallowly emarginate, in middle light green, along margin scarious, white-membranous, dorsally with densely white lanate-tomentose pubescence, at tip and inside glabrous, tightly surrounding pistillate florets; inner bracts four, somewhat concave, lanceolate, bluntish, 3 mm
326 long and 0.1 mm wide, scarious, in middle greenish, along margin white-membranous, lustrous, on dorsal side weakly pubescent along keel, elsewhere glabrous. Receptacle low, flat, rotund. Bisexual florets three or four; peripheral pistillate florets without pappus, inner pistillate and bisexual florets with pappus of 20–24 very finely scabrous-barbed bristles. Achenes 0.5 mm long and 0.2 mm wide, ovoid, flattened, glabrous, grayish, papillose. Flowering IV–IX.

Sandy places in maritime zone; introduced alien. —*Caucasus*: Western Transcaucasia (Adzharia). *General distribution*: Scandinavia, central Europe, Atlantic Europe, eastern and western Mediterranean, Balkans-Asia Minor. Described from western Europe. Type in London.

Subtribe 4. **GNAPHALINAE** Rchb. Fl. Germ. exc. (1831) 219; O. Hoffm. in Pflanzenfam. IV, 5 (1889–1894) 182. —Capitula heterogamous or homogamous, sometimes unisexual. All florets tubular; pistillate florets usually filiform-tubular; anthers usually with caudate or sagittate basal appendages; receptacle glabrous, often alveolate, more rarely with paleaceous bristles. Monoecious or dioecious herbs or semishrubs.

GENUS 1487. **Antennaria** Gaertn.[1,2]

Gaertn. De fruct. et sem. 2 (1791) 410

Dioecious plants; capitula many-flowered, globose or ovoid, in corymbose and capitate inflorescences, or solitary; involucral bracts imbricate, many-rowed, unequal, smooth, white, pink, brownish, brown, or olive-colored, apically colored or colorless, basally whitish-greenish, more or less stiff-scarious, outer bracts for the most part lanate-villous or glabrous in the lower third or half, sometimes broadened above. Receptacle convex, pitted or tuberculate, glabrous, without pales, scabrous margins of alveolae, about 2 mm wide in pistillate capitula, in staminate capitula (bisexual) about 1 mm wide. Florets different in capitula on different plants; either only pistillate fertile florets or staminate florets (bisexual, but with abortive ovary); pistillate florets with filiform-tubular, five-fid corolla, with pappus of numerous basally connate uniformly thin, weakly barbed hairs; staminate florets (bisexual, sterile) with broadly tubular or tubular-infundibuliform upwardly widened, five-fid corolla, with pappus of few, one-rowed, clavate, white bristles; anthers yellow, syngenesious, half exserted from corolla, with two filiform setaceous, basal appendages. Pistillate florets with bifid
327 stigma, more or less deeply divided into two equal or unequal lobes; in bisexual (male) florets stigma entire, abortive.

Achenes small, 0.5–1.0 mm long, oblong, cylindrical (terete), smooth or very finely papillose.

Perennial herbs, sometimes at base becoming woody semishrubs, forming loose or dense mats, with horizontal or vertical rhizome, with cord-like, largely unbranched roots. Shoots creeping, developing roots and bearing leaf rosettes or becoming erect, diverging from a vertical rhizome, densely covered with remains of old leaves; flowering shoots unbranched, largely becoming erect. Basal leaves crowded at base, often spatulate or lanceolate to linearly lanceolate and linear; cauline leaves alternate, more or less appressed to stem, usually remote, few (one to six) or quite significant number, pubescent above or on both sides, white-tomentose, as also stems, entire, often with acuminate tip or membranous, elongated appendage.

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[1] Treatment by A.G. Borissova.

[2] From the Latin word *antenna*—feelers or antennae (due to the resemblance of the pappus of the bisexual florets to the feelers of insects).

A widespread, mainly arctic and high mountain genus comprising more than 100 species adapted to temperate and northern latitudes as well as to montane habitats of Europe, Asia, North and South America, and Australia.

1. Capitula solitary (rarely in pairs)..2
+ Capitula several, terminal on stem; inflorescence corymbose-capitate, sometimes paniculate-corymbose, with capitula sessile on elongated peduncles..4
2. Leaves glabrous above, pubescent beneath; involucral bracts brownish or yellowish-greenish-brown, sometimes almost black, undivided or lacerate..3
+ Leaves pubescent on both sides; involucral bracts white in upper part, entire or barely toothed (Kamchatka, Chukotka Peninsula) ....3. **A. dioiciformis** Kom.
3. Basal leaves lanceolately spatulate, 7–19 mm long, 1.0–3.5 mm wide; involucral bracts green or yellowish brown at base, inner bracts lacerate-fimbriate at apex. Apparently apogamous plants because only the pistillate capitula are known (Kamchatka) ....5. **A. komarovii** Juz.
+ Basal leaves oblong-spatulate, about 10 mm long, 3 mm wide; involucral bracts brown to almost black in middle, at apex golden, obtuse or acutish. Male and female plants known (Alaska, Unalaska Island, Aleutian Islands. Reported from Chukotka Peninsula)..4. **A. monocephala** DC.
4. Plant with procumbent shoots; rhizome horizontal or obliquely directed; basal leaves spatulate, obovate to spatulate-oblong and spatulate-lanceolate; involucre white, pinkish to reddish, or light brownish..5 328
+ Plant with erect shoots; rhizome vertical, branching above, covered with remains of old leaves; involucre brownish at base; leaves elongated, pubescent on both sides..7
5. Involucral bracts white or pink, entire, obtuse; leaves glabrous above or pubescent on both sides..6
+ Involucral bracts brown or brownish with light spot; leaves of basal rosette glabrous..6. **A. alpina** (L.) Gaertn.
6. Heads 5–6 mm wide; involucral bracts in pistillate and staminate capitula white or pink to reddish, in staminate capitula obovate to oblong, elongate, obtuse; mature leaves of basal rosette glabrous above, pubescent beneath (young leaves of rosette may be pubescent on both sides), spatulate with extended lower part, obtuse and mucronate; lower and middle cauline leaves acute with mucro..1. **A. dioica** (L.) Gaertn.

+ Heads about 1 cm wide; involucral bracts of staminate capitula spatulate, white, acutish, densely villous outside; in pistillate capitula involucral bracts white with brownish spot in middle, acute; mature leaves of basal rosette pubescent on both sides, largely short and broadly spatulate, with short, wide petiole, apically truncate, obtuse; cauline leaves dense, 5–12, lower and middle cauline leaves obtuse, upper ones acute and mucronate (Caucasus)..2. **A. caucasica** Boriss.

7. Basal leaves linearly lanceolate, 1.5–2.0 cm long, somewhat dilated at tip, acute with sharp dark tip, pubescent on both sides; cauline leaves with long, scarious, apical appendage (Arctic Siberia)..7. **A. friesiana** (Trautv.) Ekman

+ Basal leaves broadly lanceolate to linear, 2–6 cm long, acute or obtuse, not mucronate, pubescent on both sides, or only beneath 8

8. Basal leaves glabrous above, white-tomentose beneath, large, indistinctly three-veined; pistillate florets slightly shorter than pappus (Carpathian Mountains, mountains of Central Europe) ....8. **A. carpatica** (Wahlenb.) R. Br.

+ Basal leaves densely or weakly pubescent on both sides; pistillate florets considerably shorter than pappus (Arctic Europe, Arctic Siberia, Chukotka)............................9. **A. villifera** Boriss.

Section 1. CATIPES DC. Prodr. VI (1837) 269 p. p. (emend.). — Rhizome horizontal, slender; offshoots creeping, rooting, with few 329 remains of mature leaves; leaves largely spatulate, lanceolate, or lanceolately linear, but then not longer than 2 cm; involucral bracts white, pink, or brownish; receptacle convex, subacute, alveolate.

Series 1. Dioicae Boriss. —Involucral bracts white or pink, obtuse and subobtuse, undivided; capitula medium-size, inflorescence of one to several. Basal leaves spatulate, obtuse or mucronate, usually glabrous above; cauline leaves sometimes mucronate; achenes smooth.

1. **A. dioica** (L.) Gaertn. De fruct. et sem. II (1791) 410; DC. Prodr. VI, 269; Ldb. Fl. Ross. II, 2, 612; Pflanzenfam. IV, 5, 186; Fedtsch. Perech. Rast. Turk. Ch. 3, 209; Kom. and Alis. Opredel. Dalnevost. Kr. II, 101; Fl. Yugo-Vost. VI, 321; Grossh. Fl. Kavk. IV, 101; Krylov, Fl. Zap. Sib. XI, 2693; Sugaw, Ill. Fl. Saghal, IV, 1779; Fl. Gruz. VIII, 260; Prodan Fl. Roman. I, 2, 989. —*A. dioeca* (L.) Gaertn. ex Hulten, Atlas (1950) 133. —*A. montana* S.F. Gray, Nat. Arr. II (1821) 458. —*A. hyperborea* D. Don in Engl. Bot. Suppl. (1831) tab. 2640. —*A. parviflora* Nutt. in Trans. Amer. Phil. Soc. N.S. VII (1841) 406.

—*Gnaphalium dioicum* L. Sp. pl. (1753) 850; Willd. Sp. pl. III, 3, 1882; Ldb. Fl. alt. IV, 55; MB. Fl. taur.-cauc. II, 300; III, 586; Schmalh II (1897) 46. —**Ic.**: Gaertn. op. cit. tab. 167; Pflanzenfam. l. c. fig. 95, C-E; Syreiststsch. Fl. Mosk. Gub. III, 245; Fedtsch. and Fler. Flora Evrop. Rossii 954. —**Exs.**: Dörfler, Herb. norm. No. 4129 (f. *corymbosa* Hartm.); No. 5107; Pl. Finl. exs. No. 1379, 1380, Fl. stiriaca exs. No. 298.

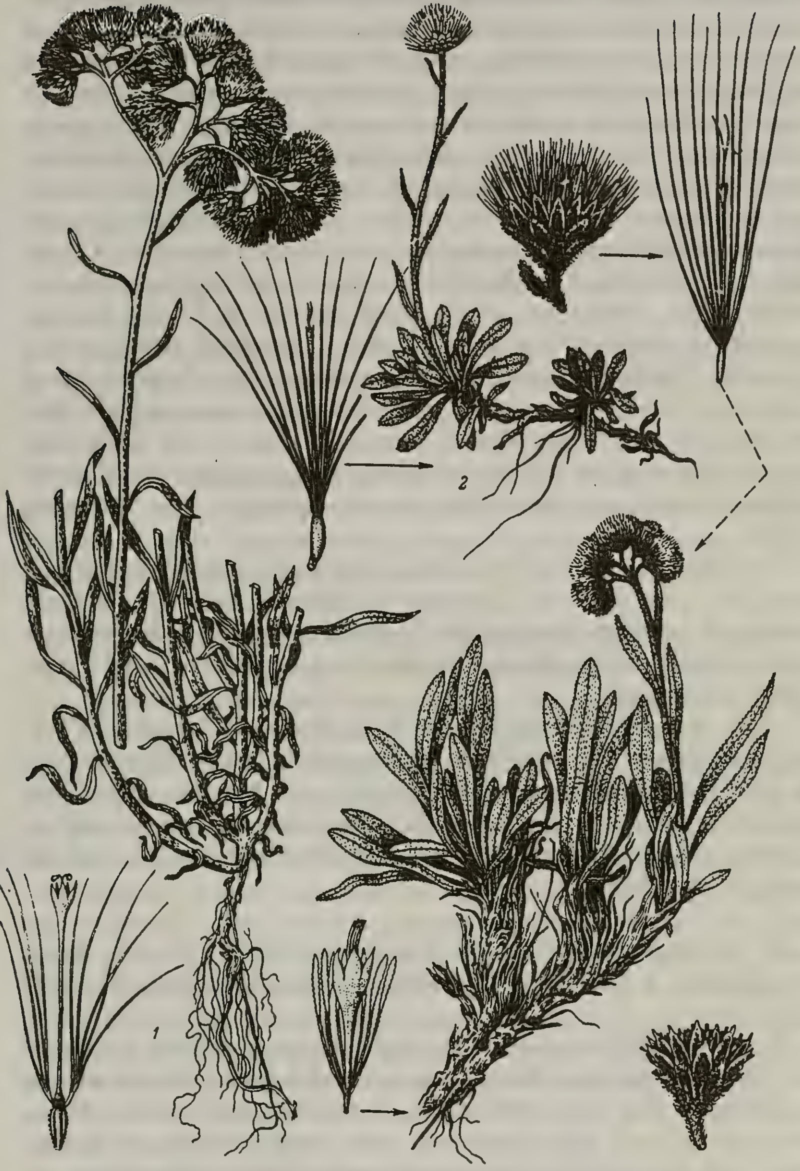
Perennial. Rhizome slender, horizontal, woody, offshoots creeping, rooting; roots slender, with few branches; flowering stems one to several, simple, straight, 3–30 cm long, white-tomentose; vegetative shoots numerous, prostrate-spreading, with crowded leaves at telescoped tips, i.e., rosettes. Basal leaves spatulate, 3–10 mm wide, obtuse, sometimes with small mucro, gradually narrowed to base into petiole, white-tomentose beneath, green and glabrous above, young ones often pubescent on both sides; cauline leaves 5–10, more or less appressed to stem, sessile, white-tomentose on both sides, upper ones almost linear or oblong-lanceolate, 10–15 mm long, 1.0–1.5 mm wide, mucronate. Capitula 3–15, 5–6 mm wide; in simple corymbose or capitate inflorescences; peduncles, as well as base of capitula, white-tomentose, usually short, sometimes elongate; capitula with staminate florets (bisexual) wider than high, with pistillate florets elongate-cylindrical. Outer involucral bracts of staminate capitula obovate, obtuse, inner ones more elongated, all white or pink, entire or at apex shallowly and unevenly toothed, at base tomentose, sometimes yellowish-brown, bright-colored; involucral bracts of pistillate capitula lanceolate to linear-lanceolate and linear, acute or acuminate, slightly toothed along margin, pink or white, 330 in lower half light green and herbaceous, in upper part membranous, outermost bracts sparsely tomentose at base. Receptacle of pistillate capitula more or less conical, pitted, scabrous, about 2 mm wide, 1.5 mm high, green; receptacle of staminate capitula conical, pitted, about 1 mm wide, and 3/4 mm high, green. Corolla of staminate (bisexual) florets white, infundibuliform-tubular, 3–5 mm long, expanded in upper part, with five (very rarely four) teeth; in a few (five or six) florets of capitula stamens slightly exserted from corolla and exceed pappus, in the rest stamens as long as corolla or shorter; anthers linearly lanceolate, syngenesious, apically somewhat acute, with filiform appendage at base; pollen abundant, yellow; stigma filiform, hardly expanded at tip; ovary undeveloped; pappus of staminate florets of a series of snow-white, clavate, flat and plumose structures, connate at base. Pistillate florets narrowly tubular, about 5 mm long, pinkish or whitish; pappus pink in pink capitula and white in white capitula; pappus hairs very fine sericeous-scabrous, finely pinnate, but not dilated at tip, hardly exceeding corolla; corolla tube with four or five filiform, unequal lobes at apex; style exserted 1 mm from corolla, bifid, with two upright, unevenly colored stigma lobes, basally bulbous. Achenes about 1 mm long, terete, smooth. Flowering V–VIII.

Open stony and sandy places, forest edges, dry and open slopes, river terraces and dry meadows, in forest zone and tundra, in mountains from the forest to alpine and subalpine zones. —*Arctic*: Europe, Novaya Zemlya, Arctic Siberia, Chukotka, Anadyr; *European Part*: Karelia-Lapland, Dvina-Pechora, Baltic, Ladoga-Ilmen, Upper Volga, Volga-Kama, Upper Dnieper, Middle Dnieper, Volga-Don, Trans-Volga, Upper Dniester, Bessarabia, Black Sea Region, Crimea, Lower Don, Lower Volga, Ural; *Caucasus*: Ciscaucasia; *Western Siberia*: Ob Region, Upper Tobol, Irtysh, Altai; *Eastern Siberia*: Yenisei, Lena-Kolyma, Angara-Sayans, Dauria; *Far East*: Kamchatka (and Kuril Islands), Okhotsk, Zeya-Bureya, Uda River area, Ussuri, Sakhalin; *Soviet Central Asia*: Aralo-Caspian, Balkhash Region, Dzhungaria-Tarbagtai. *General distribution*: Arctic, Scandinavia, Central Europe, Atlantic Europe, Mediterranean, Balkans-Asia Minor, Armenia and Kurdistan, Dzhungaria-Kashgaria, Mongolia, Beringian region. Described from western Europe.

Note. An almost circumpolar species of the Northern Hemisphere. In North America it is replaced by the closely related species: *A. rosea, A. aprica* Greene, *A. neodioica* Greene and others.

2. **A. caucasica** Boriss. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XX. —*A. dioica* auct. fl. cauc.

333 Perennial. Rhizome slender, horizontal, woody, offshoots creeping, rooting; roots slender, few-branched. Flowering stems several, simple, erect, 2–15(20) cm high, usually 10–12 cm, white-tomentose; vegetative shoots, telescoped, prostrate-spreading, with crowded rosette of leaves at tip. Basal leaves short, broadly spatulate, truncate-obtuse, very rarely somewhat acute, without sharp tip, on both sides silvery from appressed white pubescence, narrowed into short, wide petiole; cauline leaves 5–12, more or less appressed to stem, linear, 15–20 mm long, about 2 mm wide, on both sides white-tomentose; lower and middle leaves somewhat obtuse, upper acute, mucronate. Capitula quite large, about 1 cm wide, all white, very rarely slightly pink (northern Caucasus), (one) three to six, usually five, crowded in corymbose-umbellate inflorescences; in male plants in corymbose-capitate or paniculate-corymbose inflorescences; peduncles usually short, but sometimes up to 1.0–1.5 cm long, densely tomentose, as also base of capitula; staminate capitula about 1 cm wide and about 7 mm high; pistillate capitula larger, about 1 cm wide and as high. Involucral bracts of pistillate capitula white, at base light green, all tomentose, imbricate, five-rowed;



331 Plate XXI.

1—*Cladochaeta candidissima* (M.B.) DC., habit, on left—corolla with part of pappus and achene; 2—*Antennaria dioiciformis* Kom., habit, pistillate floret with achene; 3—*A. villifera* Boriss., habit, top—pistillate floret and capitulum with pistillate florets; bottom—staminate floret and capitulum with staminate florets.

outer bracts long pilose-tomentose almost throughout, ovate or oblong, obtuse; inner bracts lanceolate, obtuse, the innermost linear, subacute, all in lower part long pilose-tomentose and light green. Staminate capitula ovoid-globose (not cylindrical); involucral bracts three-rowed, all about 6 mm long, almost identical in shape, spatulate, entire, white, petaloid, in upper, broad, almost round part 2 mm wide, obtuse or slightly acute, glabrous, claw 4 mm long, about 1 mm wide, lanceolate, light olive colored, outside and along margin with matted, long-pilose pubescence. Receptacle of staminate capitula convex, about 1.5–2.0 mm wide, pitted; receptacle of pistillate capitula convex, not acute, about 3 mm wide, 1.5 mm high, pitted. Corolla of pistillate florets about 10 mm long, very narrowly tubular, white, colored only at tip; stigma exserted by 0.5–1.0 mm, not deeply bifid; pappus of fine, weakly barbed, white hairs, almost as long as corolla. Corolla of staminate florets somewhat infundibuliform, about 4 mm long, with five minute teeth, somewhat shorter than pappus; anthers not exserted; ovary undeveloped; pappus of male florets of slender, slightly thickened and slightly pinnately barbed basally connate hairs. Achenes about 1 mm long, oblong, smooth, tapering to base. Flowering VI–VIII.

In alpine zone, glacial moraines, stony slopes, meadows and pine groves, at 1,800–3,300 m. *Caucasus*: Ciscaucasia, Dagestan, western, eastern and southern Transcaucasia. *General distribution:* Balkans-Asia Minor, Armenia and Kurdistan. Described from the Glavny [Main] Range. Type in Leningrad.

Note. It is distinguished from *A. dioica* Gaertn. by the color (white, but not white and pink) and form of the capitula and involucral bracts, the form and pubescence on both sides (not only beneath) of the basal 334 and cauline leaves, the size and form of the florets and pappus, and by a number of other characters, as well as by the distribution area and the nature of its habitat.

3. **A. dioiciformis** Kom. Fl. Kamch. III (1930) 130. —*A. dioica* auct. fl. sib. p. p. non Gaertn. —*A. dioica* Hulten, Fl. Kamtch. III (1929) 162 p. p.

Perennial. Rhizome oblique, slightly elongate, with diverging flowering and vegetative shoots. Leaves of basal rosette obovate-oblong or spatulate, with very short point, or roundish and obtuse, white-tomentose on both sides, flowering stems 3–10 cm high (at fruiting stage 7–10 cm), straight, simple, one-headed, white-tomentose or in places arachnoid; cauline leaves remote, sessile, oblong-lanceolate, or linearly lanceolate, grayish-tomentose, with glabrous, scarious, apical appendage. Capitula about 1 cm wide. Involucral bracts of pistillate capitula lustrous, glabrous, or with occasional hairs along margin, brownish to brown in middle; outer bracts oblong or oblong-lanceolate, acute, white or light yellow above, at base greenish, along margin short lacerate-toothed; inner bracts linearly lanceolate, acute; pistillate florets 6 mm long, narrowly tubular, with four fine, filiform teeth at apex; style exserted to 1 mm, gradually dilated to base, with short bifid stigma; pappus 7 mm long, slightly longer than corolla, of fine scabrous-plumose hairs, brownish in upper third. Achenes about 1.5 mm long, 0.5 mm wide, oblong, smooth; staminate (bisexual) capitula unknown. Flowering VII–VIII. (Plate XXI, Fig. 2).

Alpine zone. —*Far East*: Kamchatka (peak of the Poperechnaya Mountain and Mt. Krasheninnikov). Described from Kamchatka. Type in Leningrad.

Note. It is distinguished from *A. dioica* by pubescence on both sides of the leaves, solitary capitula, glabrous involucral bracts and longer, more fragile pappus hairs.

Series 2. Monocephalae Boriss. —Involucral bracts brownish, from yellowish- and greenish-brown to almost black, undivided or fimbriate-lacerate at apex. Mature leaves glabrous above, pubescent beneath. Capitula solitary, very rarely two.

4. **A. monocephala** DC. Prodr. VI (1837) 269; Ldb. Fl. Ross. II, 2, 611. —*A. alpina* Lessing in Linnaea VI (1831) 221, non Gaertn. —*A. alpina* β. *monocephala* Torrey and Gray Fl. bor. am. II (1800) 430. —? *Gnaphalium pallasii* Spreng. Syst. veget. 3 (1826) 470.

Perennial. Rhizome slender, horizontal, with few rooting offshoots; flowering stems about 10 cm high or less, not densely tomentose. Leaves of basal rosette villous and white-tomentose below, green above, 335 oblong-spatulate, about 10 mm long, 3 mm wide, without distinct veins, sharp-pointed; cauline leaves sublinear or linear, not densely tomentose, at apex glabrous with brownish glabrous appendages, about 2 mm long. Heads solitary (very rarely two). Involucral bracts imbricate, about 4 mm long, reticulate, subscarious, brown or grayish-violet, dark brown to almost black in middle, at apex golden; inner bracts of pistillate capitula linearly lanceolate, acuminate, in staminate capitula elliptical, obtuse or subacute. Corolla of pistillate florets about 0.2 mm wde; style long exserted, bifid; in staminate florets corolla 0.6–1.0 mm wide. Pappus hairs clavate. Fowering VII–VIII.

This species is reported from the Chukotka Peninsula (Chamisso, Eschscholtz). *General distribution*: Beringian Region (Alaska, Aleutian Islands). Described from Unalaska. Type in Switzerland.

5. **A. komarovii** Juz. ex Kom. Fl. Kamch. III (1930) 130. —*A. alpina* Hulten, Fl. Kamtch. III (1929) 161, non Gaertn.

Perennial. Rhizome short-branched, forming mat; vegetative offshoots telescoped, some with rosettes of basal leaves, prostrate, creeping. Basal leaves narrow, lanceolate-spatulate, 7–19 mm long, 1.0–3.5 mm wide, with short, pointed tips or subacute, gradually tapered to base, densely grayish-tomentose beneath, green and barely tomentose above or glabrescent, almost concolorous. Flowering stems simple, erect, tomentose or flocculose-pilose, slender, 3–10 cm long. Cauline leaves seven to nine, narrow, linear-lanceolate, about 1 cm long, 1–2 mm wide, more or less acute, somewhat reduced upward, appressed to stem, with scarious, apical appendage about 1.5 mm long. Capitula solitary, rarely two, about 1 cm wide, 8–9 mm long. Outer involucral bracts oblong-lanceolate, basally sparsely hairy, later glabrescent, basally green or yellowish-brown outside, at apex scarious; inner bracts linear, scarious, upper margin lacerate, grayish-olive turning brown. Pistillate florets filiform, about 5 mm long; stigma shallowly split, exserted from tube to 1 mm; pappus longer than floret, 6 mm long, slightly longer than involucre, of white, setaceous hairs with long, sharp, almost straight barbs. Achenes oblong, about 1 mm long, 0.3 mm wide, smooth. Staminate florets unknown; plants possibly apogamous. Flowering VII–VIII.

Lichen-meadow tundra, alpine meadows, among stones and lichens. *Far East*: Kamchatka. Endemic. Described from the Krasny [Red] Mountains in Kamchatka. Type in Leningrad.

Note. It is distinguished from *A. alpina* (L.) Gaertn. and *A. friesiana* Ekman. by its solitary capitulum, leaves that are glabrescent above, and longer involucral bracts. According to S.V. Juzepczuk, it is distinguished 336 from *A. monocephala* DC. by the pubescence of the leaves and, possibly, by apogamy; from *A. dioiciformis* Kom. it is distinguished by the form and pubescence of the leaves.

Series 3. Alpinae Boriss. Involucral bracts acuminate, brownish or light yellowish; inner ones split or toothed. Capitula small, few. Leaves lanceolate to narrowly linear, sharply acute, glabrous above or pubescent on both sides; cauline leaves with more or less long scarious appendages. Achenes smooth or papillose.

6. **A. alpina** (L.) Gaertn. De fruct. et sem. II (1791) 410; DC. Prodr. VI, 269 excl. diagn. p. p.; Rune and Rönn. in Svensk. Bot. Tidskr. 50, 1 (1956). —*A. alpina* (L.) R. Br. in Trans. Linn. Soc. XII (1812) 122; Ldb. Fl. Ross. II, 613; Pflanzenfam. IV, 5, 186; Fedtsch. and Fler. Fl. Evrop. Ross. 957. —*A. alpina* var. *typica* Fernald in Rhodora 26 (1924) 98 p. p. —*Gnaphalium alpinum* L. Sp. pl. (1753) 856; Ldb. Fl. Ross.

II, 2, 611. —*A. carpatica* Ldb. op. cit. 612 p. p. **Ic.**: Rchb., Pl. crit. 8, tab. 750; Rhodora, vol. 36 (1934) 281 (type!); Lindeman, Bild. Nord. Fl. I (1922) t. 29. —**Exs.**: Dörfler, Herb. norm. No. 5108; Schultz, Herb. norm. No. 2208.

Perennial. Plant with slender, creeping rhizome, with well developed vegetative offshoots from rosettes of leaves and few flowering stems. Stem 3–10(15) cm high, erect, simple, densely tomentose. Cauline leaves four to eight, sessile, linear, somewhat tapered to base, 1.0–1.5 cm long, 1.0–1.5(2) mm wide; upper and middle leaves upwardly acuminate in glabrous, scarious, linear-lanceolate appendage; lower leaves subacute, all tomentose beneath, glabrous or subglabrous above; upper leaves more densely pubescent; basal rosette leaves of vegetative offshoots narrowly spatulate, oblanceolate, 1.0–1.5 cm long, 2.0–3.5 mm wide, glabrous and green above, soft tomentose beneath, with short, sharp point or more or less acute. Capitula three to five, subsessile or on short, tomentose pubescent peduncles, forming subulate-capitate inflorescences, about 2 cm wide and 1 cm high; capitula small, bearing pistillate florets 5–7 mm long and 5 mm wide, lower capitula on short tomentose peduncles. Involucral bracts of pistillate capitula five- or six-rowed; outer bracts oblong-lanceolate, 4–5 mm long, erose along margin, obtuse, long-pilose-tomentose; inner bracts linear, acuminate, about 7 mm long, along margin unevenly toothed, all scarious, greenish, light brown, or brownish, reticulate. Receptacle pitted-tuberculate. Pistillate florets about 5 mm long, narrowly tubular; style barely exserted; stigma shallowly split into two unequal branches; style dilated at base, in upper part more intensely colored, reddish; pappus about 6 mm long, of fine scabrous hairs, slightly longer than floret. Achenes oblong, about 1 mm long, 0.3 mm wide, smooth,
337 glabrous, staminate (bisexual, sterile) capitula about 5 mm high, 1 cm wide. Involucres bright, weakly brownish, three- or four-rowed; outer bracts oblong, in lower part long-tomentose-pilose; inner bracts lanceolate-spatulate, with long intertwined hairs, all obtuse, margin slightly lacerate or entire; staminate florets 4.5–5.0 mm long, in upper part infundibuliform with five tiny teeth; anthers with two filiform appendages; ovary rudimentary; style at tip weakly dilated, pappus parts shallowly pinnately dissected above, dilated and flat, white, barely exceeding floret. Flowering VII–VIII.

Alpine zone. Arctic Europe (Rybachy Peninsula, according to Hultén). *General distributiion:* Scandinavia. Described from Swedish Lapland. Type in London.

Section 2. UROLEPIS Boriss. Rhizome slender or quite robust, vertical, branched in upper part, densely covered with blackish brown remains of old leaves of previous years; offshoots erect, neither creeping nor rooting. Leaves elongated, linear or linear-lanceolate, 1.5–2.0 cm or 5–7(10) cm long; involucral bracts more or less scabrous, brownish; receptacle convex, plicate-rugose or tuberculate-pitted.

Series 1. Sibiricae Borris. —Basal leaves 1.5–2.0 cm long, sharp-pointed, narrow, linear-lanceolate or rhombic-spatulate, widest in upper part, tapering to base; lower cauline leaves 1.0–1.5(2) cm long; receptacle tuberculate-pitted.

7. **A. friesiana** (Trautv.) Ekman in Svensk. Bot. Tidskr. 22 (1928) 416 p. p.; Juzepczuk in Kom. Fl. Kamch. III (1930) 131 p. p. —*A. alpina* var. *friesiana* Trautv., in Tr. Peterb. Bot. Sada VI (1879) 24; Hulten, Fl. Kamtsch. (1929) 161. —*A. alpina* var. *friesiana* (Trautv.) Juz. ex Kom. op. cit. 131. —*A. alpina* auct. fl. Sibir. p. p. —*A. alpina* var. *pleiocephala* Trautv. in Tr. Peterb. Bot. Sada V, 2 (1877) 537 p. p. —*A. alpina* var. *monocephala* Trautv. ibid. (1877) 72.

Perennial. Plants with vertical or almost vertical slender root branched in upper part and forming compact mat; roots slender, sparsely branched; flowering stems 5–10(15) cm high, slender, arachnoid-flocculose pubescent. Cauline leaves about 1.5 cm long, 1.0–1.5 mm wide, lanceolately linear or linear, acute, on both sides arachnoid-tomentose, with broad scarious, glabrous appendage, 2–3 mm long; basal rosette leaves narrow, linear-lanceolate, rhombic-spatulate, 1.5–2.0 cm long, 1.5–2.5 mm wide in upper part, tapering to base, acute, with short, dark, glabrous, sharp tip, on both sides tomentose, less often with appressed gray hairs. Inflorescence corymbose-capitate, of 1–3(5) crowded capitula; sometimes capitula on short peduncles. Receptacle tuberculate-pitted, rounded-convex. Involucral bracts of capitula with pistillate florets four- or five-rowed; outer bracts ovate-oblong or oblong, acute, along margin 338 finely toothed, long-pilose-tomentose; inner bracts lanceolate or narrowly lanceolate, all light brown or greenish-brown with darker spot in middle, at base more brightly colored. Pistillate florets tubular, 6.0–6.5 mm long; stigma weakly bifid, barely exserted from corolla tube; pappus slightly longer than floret. Achenes 1.5 mm long, oblong-cylindrical, smooth. Staminate florets and capitula unknown. Flowering VI–VIII.

In tundras, on dry stony slopes and mounds, on gravels, outcrops and in alpine zone. —*Arctic*: Arctic Siberia, Chukotka, Anadyr; *Eastern Siberia*: Lena-Kolyma (northeastern part). Endemic. Described from the Anadyr River. Type in Leningrad.

Note. A. friesiana was treated by Trautvetter as *A. alpina* var. *friesiana* Trautv. Ekman combined the American and the Asian species into one. The American plants of this species had already been described earlier (1841) as *A. labradorica* Nutt. and later (in 1927) as *A. angustifolia* Ekman, non Rydb. (1899).

The American specimens of *A. labradorica* (=*A. friesiana* Ekman s. str.) are distinguished from *A. friesiana* by the following characters: involucral bracts two- or three-rowed and not four- or five-rowed; pistillate florets about 7.5 mm long and not 6.0–6.5 mm, pappus as long as florets but not longer; basal leaves without sharp-pointed tip, achenes less than 1 mm long and papillose. Malte (*Rhodora* 36 (1934) 114) distinguishes the Siberian *A. alpina* var. *friesiana* (Trautv.) from *A. labradorica* Nutt. by the broadly lanceolate apex of inner involucral bracts, which in the American species are linear or linear-lanceolate and long-attenuate. The basal leaves in the Siberian species are elongate, narrower than in *A. labradorica*, becoming glabrescent with age, with a sharp-pointed tip, almost 1 mm long and not so silvery as the American plants of *A. labradorica* Nutt. The basic difference of this species from *A. alpina* (L.) Gaertn. is the unique form of the rhizome and the growth form, which justify referring *A. friesiana* to another section of the genus.

Series 2. Carpaticae Boriss. —Basal leaves 5–7(10) cm long, acute or subobtuse, without mucro, lanceolate or linear-lanceolate, tapering to both ends, widest above or near middle of leaf; lower cauline leaves 2–3 cm long; receptacle plicate-rugose.

8. **A. carpatica** (Wahlenb.) R. Br. in Trans. Linn. Soc. XII (1818) 123; Hegi, Ill. Fl. VI, 1. 457; Szafer et al. Rosl. Polski (1924) 611; Prodan, Fl. Rom. I, 2 (1939) 989; Popov, Ocherk Rast. i Fl. Karp., 244; Viznachn. Rosl URSR (1950) 526. —*A. carpatica* Bluff. and Fing. Compend. Fl. Germ. II (1825) 348; DC. Prodr. VI, 269 p. p.; Dostal, Květ. ČSR, 1553. —*A. carpatica* Trautv. in Tr. Peterb. Bot. Sada V (1879) 24 p. p. —*A. carpatica* var. β. Wählenb. Fl. Suec. II (1833) 535.
339 —*A. alpina* Ldb. Fl. Ross. II, 2 (1845–1846) 612, p. p. —*Gnaphalium carpaticum* Wahlenb. Fl. carp. (1814) 258. —**Ic.**: Wahlenberg op. cit. t. III; Rchb. f. Ill. Fl. Germ. XVI (1853), t. 951; Hegi, op. cit. 464, f. 234, a–c; Javorka and Csapody, Iconogr. Fl. Hung. (1934) 512, f. 3666; Dostal, op. cit. fig. 507, 3. —**Exs.**: Fl. Hung. exs. No. 573; Herb. norm. No. 70; Fl. pol. exs. No. 646; Fl. Gall. et Germ. exs. No. 391.

Perennial. Rhizome vertical, branched in upper part and densely covered with dark brown remains of leaf petioles of previous year's; creeping shoots absent, but erect, telescoped, vegetative shoots arising from upper part, with rosettes of basal leaves; flowering stems solitary or several, erect (5)10–18 cm long, grayish-white from dense arachnoid-tomentose pubescence. Cauline leaves remote, five or six, sessile,

glabrous above tomentose-pilose beneath; upper leaves narrowly linear, lower ones linear lanceolate and lanceolate; 1.0–1.5 cm long, 0.5–1.0 mm wide, acuminate, with filiform scarious tip; lower leaves acute, 1.5–3.0 cm long, 3–4 mm wide; leaves of basal rosette lanceolate, acute, tapering to base, 4–6 cm long, 3–7 mm wide, in upper third; leaves glabrous above, dark green, with indistinct, usually one or three midveins, blue-gray or whitish gray beneath from appressed and tomentose, dense pubescence; sometimes leaves silvery or partly short-arachnoid. Capitula in clusters of four to six on short, tomentose peduncles, crowded into compact corymbs or capitate inflorescences, 1.5–5.0 cm long; capitula with pistillate florets 7–10 mm wide, 5–7 mm with staminate florets. Receptacle plicate-rugose, convex, subacute. Involucral bracts multiseriate, imbricate, three- or four-rowed, subscarious, lustrous, olive-brown, at base light green, in middle darker, reticulate-sulcate, glabrous, except outer ones, which at their bases are tomentose from long, densely matted hairs; in pistillate capitula outer involucral bracts lanceolate, along margin shallowly lacerate; inner bracts linear, acute, tapering to base; in staminate (bisexual) florets involucre rotund-ovate or ovate-oblong, obtuse, at tip shallowly and unevenly cut, crenate-dentate. Staminate florets slightly shorter than or exceeding pappus, dilated in upper part, five-toothed, about 5 mm long; anthers exserted from corolla, connate with basal filiform outgrowths; style not exserted, undivided; ovary undeveloped; pappus hairs white, about 7 mm long, very shallowly and obtusely pinnate throughout their entire length, at tip flat and very weakly dilated. Pistillate florets narrow tubular, 8–9 mm long, dark reddish, shorter than pappus; style exserted from corolla nearly 3 mm, bifid; stigma lobes filiform, upright, short. Achenes about 2 mm long, 0.5 mm wide, oblong-lanceolate, somewhat tapering to base, brownish-greenish, glabrous, smooth, very finely sul-
340 cate, at base obliquely truncate; pappus hairs longer than pistillate floret very slightly, sericeous, almost smooth, with sparse barbs, connate at base. Flowering VI–VIII; fruiting VIII–IX.

Rocky slopes of mountains at 1,800–3,200 m, in alpine zone. —*European Part*: Upper Dniester (Carpathian Mountains). *General distribution*: Central Europe (Hungary, Austria). Described from the Carpathian Mountains. Type in Stockholm (?).

Note. A. carpatica (Wahlenb.) R. Br. s. str. is distributed only in the Carpathian Mountains and mountains of Central Europe (Austria and Hungary). The species of Arctic Europe, Arctic Siberia and North America which are being referred to *A. carpatica*, differ from it but can be referred to the arctic-alpine series *Carpaticae* Boriss. by the nature of the shoot growth, vertical, branching rhizome, leaves elongated to

5–10 cm lanceolate to linear and subscarious, brownish involucral bracts. A number of closely related species grow in North America.

9. **A. villifera** Boriss. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XX. —*A. carpatica* auct. fl. ross. Eur. et Sib. non R. Br. —Krylov, Fl. Zap. Sib. XI, 2695. —*A. carpatica* var. *laestadiana* Trautv. in Tr. Peterb. Bot. Sada, VI, 1 (1879) 24, p. p. —*A. alpina* Ldb. Fl. Ross. II, 2 (1845–1846) 612 p. p. —*Gnaphalium carpaticum* auct. fl. Ross. et Sib., non Wahlenb.

Perennial. Roots numerous, not branching, slender, cordiform; rhizome vertical or somewhat oblique, in upper part densely covered with dark brown or almost black remains of leaf petioles of previous year's; vegetative offshoots erect, telescoped, arising from upper parts of branching rhizome, bearing rosette of basal leaves. Flowering stems solitary, less often five to seven, erect, 7–20 cm high, grayish from scattered, partly flocculose, tomentum. Cauline leaves few, two to five(six), remote, sessile, lanceolate to linear, pubescent on both sides, loosely tomentose or appressed- and partly spreading-lanate, apically brownish scarious, subacute, 1.0–2.5 cm long, 2.5 mm wide; leaves of basal rosette lanceolate or linear-lanceolate, acute or obtuse, but then oblong-lanceolate, 2–6 cm long, 4–7 mm wide, with maximum width in middle or upper part, with scarious apical appendage, gradually tapered into long petiole, 2.0–2.5 cm long, on both sides not densely tomentose-lanate, with three almost parallel prominent veins. Capitula five or six, on short, sometimes longer, tomentose peduncles, crowded into compact, capitate inflorescences, 1.5–3.0 cm wide; capitula with staminate (bisexual) florets 5 mm high, with pistillate florets about 13 mm high and 5–10 mm wide. Plants dioecious; receptacle convex but not acute, pitted and shallowly plicate-rugose. Involucre at base of capitula rotund, in female inflorescences 5–7 mm high, in male inflorescences 4–5 mm; 341 involucral bracts of pistillate capitula imbricate, many-rowed (four rows), dark brown, scarious; outer bracts shorter, at base tomentose, oblong, dilated toward base, at base acute; inner bracts linear, somewhat dilated toward base, acuminate, brownish, with whitish deltoid base. In staminate (sterile) capitula involucre ovate-oblong, brown, obtuse, almost entire, tapering to base; inner bracts oblong, toothed-lacerate along margin and at apex, tapering to base; staminate florets 4 mm long, with narrowly infundibuliform corolla with five bluntish teeth; anthers fused with two filiform appendages at base; style slightly expanded at tip, not split; ovary undeveloped; pappus almost as long as corolla; pappus hairs dilated at apex, along margin scabrous, flat. Pistillate florets narrow, tubular, 6–7 mm long, with style exserted to almost 2 mm, at tip shallowly bifid; pappus 10(11–12) mm long, of fine hairs, together with achene considerably longer than floret. Achenes about 1 mm long, 0.3 mm wide, oblong, glabrous, smooth. Flowering VI–VII. (Plate XXI, Fig. 3).

Dry slopes and ridges, sandy banks of streams and rivers, in mossy, herbaceous, stony and gravelly tundra; often along seashores on sandy substrate. —*Arctic*: Arctic Europe (Polar Ural, Novaya Zemlya, Vaigach, Kolguev), Arctic Siberia (Yamal, Taimyr, lower reaches of the Yenisei), Chukotka (Anadyr, rare); *Eastern Siberia*: Lena-Kolyma, Angara-Sayans (Kitoiskii Range, Khamar-Daban). Endemic. Described from Kolguev Island. Type in Leningrad.

Note. This species is distinguished from *A. carpatica* (Wahlenb.) R. Br. s. str., with which it was confused, by gray-tomentose or shorter pubescence on both sides (and not only beneath) of the leaves, pistillate florets considerably shorter than the pappus (and not longer than the pappus), shorter style (not strongly exserted from the corolla tube), and other characters; it is distinguished also by its ecology and range.

One can distinguish the following ecological and geographic varieties, which, with additional material and more detailed field work, may prove to be separate races.

1. var. *ircutensis* Boriss. —Inner involucral bracts of pistillate florets linear with oblong pellucid spot from base to middle, often lacerate-acute at tip; style exserted one-third or less; plants to 28–30 cm high, leaves linear, long; alpine zone of the Kitoiskii Range and Khamar-Daban, on stony talus.

2. var. *septentrionalis* Boriss. —Basal leaves very long and narrow, lanceolate-linear and linear, with long narrow petiole, almost equaling lamina; cauline leaves linear; plants with staminate capitula 6–10 cm high, with pistillate capitula 10–20 cm high; Taimyr, Yamal.

3. var. *jacutica* Boriss. —Female plants up to 25 cm high; male plants 7–12 cm high; basal leaves oblong-lanceolate, obtuse, 3–4 cm 342 long, gray-tomentose on both sides; capitula distinctly pedunculate. Female florets about 6 mm long; with half of style exserted from tube; stigma very shallowly, often unequally bifid; pappus 11–12 mm long together with achene; involucral bracts often dark brown; Yakutia.

GENUS 1488. **Leontopodium** R. Br.[1,2]

In Trans. Linn. Soc. XII (1817) 124, nomen; Cassini in Bull. Sc. Soc. philom. Par. (1819) 144; in Dict. Sc. nat. XXV, 473; DC. Prodr. VI,

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[1] Treatment by V.I. Grubov.

[2] From the Greek words *leon*—lion, and *pous*—foot (so named for the habit; the plant with simple, lanate-pilose stem).

274; Beauv. in Bull. Soc. bot. Genève, sér. 2, I, 185; Hand.-Mazz. in Beih. Bot. Centralbl. XLIV, abt. II, H. 1. —*Gnaphalium* L. Sp. pl. (1753) 855, p. p. et auct. pl. —**Filago** L. Sp. pl. (1763) 1312 p. p. —*Antennaria* Gaertner, De fr. et sem. pl. II (1791) 410 p. p. et auct. pl. —*Simlera* Bubani Fl. Pyren. II (1900) 196

Inflorescence terminal, of several, less often solitary, capitula aggregated into more or less compact clusters or cymes, surrounded by bracts that are usually spreading and unlike leaves, more tomentose and bright above than below and thus quite distinct, forming a more or less noticeable "star" typical of this genus. Capitula saucer-shaped, many-flowered with flat and smooth, alveolate receptacle and irregularly many-rowed, uniform elliptical involucral bracts, which are lanate outside, smooth and lustrous inside, and with thin membranous apex and margins. Capitula largely heterogamous, the florets of four types: 1) staminate, more precisely sterile bisexual, with 5-fid tubular-infundibuliform corolla, developed style entire, villous at tip, aborted ovary, and clavate inflated pappus bristles; 2) pistillate—fertile with filiform or narrowly tubular, three- or four-fid corolla, without stamens, style not villous and without basal nectary, but with deeply bifid stigma and pappus bristles not thickened at tip; 3) bisexual—fertile, with tubular-infundibuliform corolla, developed stamens, style villous at tip, with bifid stigma and basal nectary, and pappus bristles little if at all thickened at tip; 4) asexual nectariferous—with tubular-infundibuliform, four- or five-fid corolla, aborted anthers and ovary, style entire, not villous, and without stigma but with strongly developed nectary. Usually central florets staminate in all capitula, but the few peripheral florets, pistillate, sometimes outer capitula in inflorescence only with pistillate florets; rarely central capitulum only with staminate florets, and outer only pistillate to entirely dioecious or almost so; very rarely central capitula with pistillate but outer with staminate florets. Nectariferous florets 343 rare, but bisexual florets extremely rare. Stamens with broadly linear, caudate anthers, with attenuate-acuminate connective, on short filaments; style abruptly tapering to base; ovary, as well as achene, smooth, villous or pilose. Achene oblong-obovoid, slightly compressed, with caducous pappus; pappus bristles uniseriate, thin, basally free, barbellate or almost smooth.

Perennial herbs, sometimes stemless, with sterile tufts or rosettes of leaves and simple, erect, leafy stems. Leaves simple, entire, linear to spatulate and oblong-obovate, sessile or (basal and rosette leaves) sheathed-semipetiolate, usually more pubescent and brighter beneath than above.

About 30 species distributed in the montane regions of Eurasia (mainly in Southeast Asia), excluding the Caucasus and Asia Minor, growing mainly in the high-montane and montane-steppe zones.

Note. Of the two relatively recent monographic treatments of this genus by Beauverd (1909, 1924) and Handel-Mazzetti (1927), neither one can be considered fully satisfactory (and neither is followed here) because the proposed systems for the genus are farfetched and unsound, in part because of the confusion and excessive splitting in the delimitation of the species. The treatment of the second author is, however, the better-founded.

1. Bracts clearly differ from cauline leaves by their form and pubescence, surpassing inflorescence, wide spreading and forming a more or less distinct “star.”..3

+ Except in size, bracts not different from cauline leaves, erect and not forming “star;” pappus very long................................2

2. Plant usually acaulescent, 1–2 cm high, rarely with a single (sometimes two or three) stem up to 5 cm (very rarely to 10 cm) high; capitula solitary, large, up to 1.5 cm wide and 1.5 cm high, or two or three (rarely to five), smaller, in densely aggregated clusters surrounded by few, inconspicuous bracts not surpassing inflorescence; entire plant light gray from loose tomentum. Pappus white, 6 mm long in staminate florets to 9 mm in pistillate florets..............7. **L. nanum** (Hook. f. and Thoms.) Hand.-Mazz.

+ Plant usually with several stems, 20–25 and up to 40 cm high, less often shorter; inflorescence of three or four small capitula surrounded by same number of narrow, strictly erect bracts indistinguishable from upper leaves; entire plant covered by grayish-sericeous or, less often, ashy-flocculose pubescence. Pappus dirty white, 4 mm long in staminate florets to 6.5 mm in pistillate florets...............4. **L. leontopodioides** (Willd.) Beauv.

344 3. Upper side of leaves usually broad-lanceolate, green and glabrous or noticeably more weakly and differently pubescent than lower side; bracts broad, forming large, sharply distinct “star” 4

+ Upper and lower sides of usually narrow oblong-linear or linear-lanceolate leaves do not differ essentially from each other in color or pubescence, but if they differ, then bracts narrow and “star” not so distinct..6

4. Plants large, 15–30 cm high, with lanceolate, acute, cauline leaves; bracts few, greenish beneath (Far East)...........................5

+ Alpine plant, 3–10(15) cm high; leaves ligulate or spatulate-lanceolate to ovate-lanceolate, green and glabrous or arachnoid-pubescent above, densely white-tomentose beneath. "Star" regular, snow-white, many-rayed, of thickly tomentose, concolorous bracts, broad at base and taper at tip (Carpathian Mountains)..8. **L. alpinum** Cass.

5. Stems slender, mostly flexuous, often ascending, glabrescent below, reddish-brown; leaves thin, bicolored, green (often darken after drying), glabrous or finely arachnoid above, finely white-tomentose beneath; bracts densely white-tomentose above, greenish (after drying often yellowish-green) and less densely tomentose beneath, quite variable in size and, therefore, forming irregular-rayed "star"..................................2. **L. discolor** Beauv.

+ Stems thick, angular, erect and stiff, sometimes glabrate and more or less violet below; leaves green or greenish and arachnoid above, loosely white-tomentose beneath; bracts densely white-tomentose (or slightly yellowish) above, slightly greenish, ovate-lanceolate beneath, forming large, almost regular, five(six)-rayed "star", about 6 cm wide with large capitulum, up to 1 cm wide, in center and 6–10 small outer capitula........................ ....1. **L. palibinianum** Beauv.

6. Bracts not different from leaves by color and pubescence; leaves with prominent midrib, thickish (oblong-spatulate to elongate-obovate); entire plant light ashy-tomentose, forming compact mats with dense rosettes of leaves and stiff, glabrous, woody stolons up to 10 cm long.........................6. **L. brachyactis** Gdgr.

+ Bracts differ from leaves in color and pubescence; leaves without prominent midrib, thin; stolons herbaceous, short, usually absent..7

7. "Star" white (in sicco!) with narrow rays; entire plant loosely gray-tomentose, but leaves usually densely and finely white-tomentose beneath; bases of hairs (under tomentum) often have glandular swelling....................................3. **L. kurilensis**[†] Takeda

345 + "Star" sulfur-yellow, yellowish-greenish, or yellowish (in sicco!), but not pure white; entire plant white- or grayish-pubescent; bases of hairs without glandular swellings...................................8

8. High-montane plant, usually 5–10 cm high, forming compact mat with mass of sterile rosettes of leaves and developing slender brown scaly stolons; bracts broadly lanceolate or oblong-elliptical, loosely tomentose, sulfur-yellow (in sicco!), forming small but compact and regular "star", 1–2 cm wide............ ....5. **L. ochroleucum** Beauv.

[†] Mistakenly spelled "kirilense" in Russian text.—Sci. Ed.

+ Montane-steppe and meadow-steppe plants, usually 15–35 cm high, not forming compact mats and not developing stolons; bracts narrower, differing little in pubescence from cauline leaves; "star" larger, 2–5 cm wide and usually variable-rayed................9

9. Bracts yellowish or almost white, linear-lanceolate or oblong-linear (as also leaves), with revolute margins, forming loose and irregular, often solitary "star," 2–3 cm wide; cauline leaves usually marcescent, drooping; stem often glabrescent, flocculose-tomentose, light ash-colored, usually forming loose many-stemmed mats...
............5a. **L. ochroleucum** Beauv. var. **campestre** (Ldb.) Grub.

+ Bracts yellowish-greenish or white, narrowly ovate or lanceolate, wide and flat at base and abruptly tapered, revolute along margins at tip, forming quite compact "star," 3–5 cm wide; inflorescence usually branched forming corymb of several "stars;" stem solitary or two or three together, usually not glabrescent; cauline leaves erect, but pubescence appressed, dense, grayish ....5b. **L. ochroleucum** Beauv. var. **conglobatum** (Turcz.) Grub.

1. **L. palibinianum** Beauv. in Bull. Soc. bot. Geneve, sér. 2, V (1913) 280; Kom. and Alis. Opredel. Rast. Dalnevost. Kr. II, 1018. — **Ic.**: Beauv. op. cit. 281, fig. 1.

Perennial. Large plant, 25–35 cm high; stem one to five, straight and stiff, angular, to 2.5 mm thick, ashy arachnoid pubescence toward base glabrate, violet, below inflorescence greenish-tomentose, at base covered by brown scaly remains of sheaths and dark gray remains of leaves with numerous (up to 20) leaves; cauline leaves lanceolate to broadly ovate, 2.5–6.0 cm long and 0.5–1.3 cm wide, acute, with hydathode at tip, lower leaves tapered into sheath, up to 2 cm long and 3–4 mm wide; basal leaves (marcescent before anthesis) and leaves of vegetative shoots lanceolate-elliptical, with lamina up to 7 cm long, tapered to flat petioles up to 10 cm long, green, arachnoid pubescent above, white-flocculose, with prominent midrib and two indistinct lateral veins beneath. 346 Bracteal leaves 5–10, five or six of them large, elliptical or ovate-lanceolate, retuse, to 3 cm long and 10 cm wide, densely white-tomentose above, forming large, beautiful, almost regular 5-rayed "star," 5–6 cm wide. Capitula compactly clustered, 7–11, the central one large, up to 10 cm wide, surrounding ones smaller. Involucral bracts about 5 mm long, long-lanate on back, with barely projecting blackish-brown tips; florets bisexual or only staminate, tubular-campanulate, about 5 cm long, or only pistillate, narrowly tubular. Pappus bristles about 5 mm long, in bisexual florets, clavate-thickened at tip; achenes pilose. Flowering VI–VII; fruiting VIII–IX?

Dry meadows and meadow slopes of seacoasts. —*Far East:* Ussuri (eastern slope of Sikhote-Alin: Tadushe River, Sudzukhe River-Cape Stolbovoi). Endemic. Described from the Tadushe River. Type in Leningrad.

Note. I cannot agree with Handel-Mazzetti (l. c. 1927), who included the eastern Siberian *L. sibiricum* var. *conglobatum* Turcz. in the species despite Beauverd's (l. c. 1913) clear indication of its separate identity and differences from the latter species and in spite of the obvious gap in their ranges. He thought that the plant described by Beauverd from the Sikhote-Alin represented only an extreme, luxuriantly developed form of Turczaninov's variety. Despite the undoubted affinity between them, this species differs from it [*L. sibiricum*] all the same, by a whole series of persistent features, besides being a robust plant. This was confirmed by the recent discovery of the species from another, more southern site on the Pacific slope of the Sikhote-Alin—on the Sudzukhe River, which exactly matches the type and description of Beauverd. *L. palibinianum* Beauv. is a mesophilous meadow species, close in a number of characters (nature of pubescence, form of bracts) to the Far Eastern *L. discolor* Beauv., and it would appear to be a connecting link between the East Asiatic *L. japonicum* Miq. group and the *L. ochroleucum* Beauv. group.

2. **L. discolor** Beauv. in Bull. Soc. bot. Genève sér. 2, 1 (1909) 188, 195, 375; Hand.-Mazz. in Beihefte Bot. Centralbl. XLIV (1927) 147; Kom. and Alis. Opredel. Rast. Dalnevostoch. Kr. 1018. 346 —*L. tataricum* Kom. in Izv. Peterb. Bot. Sada, X (1910) 116; Beauv. op. cit. V (1913) 281; Hand.-Mazz. op. cit. 71; Kom. and Alis. Opredel. Rast. Dalnevost. Kr. 1018. —*L. japonicum* ssp. *sachalinense* Takeda in Bull. Soc. bot. Genève, sér. 2, III (1911) 152; Beauv. ibid. IV (1912) 22. —*L. sachalinense* Miyabe and Kudo in Miyabe and Miyake, Fl. Saghalin (1915) 303. —*L. coreanum* Nakai in Bot. Mag. Tokyo XXXI (1917) 109. —*L. sibiricum* auct., non Cass.; Schmidt in Mém. Ac. Sc. St. Pétersbg. XII (1868) 151. —**Ic.**: Beauv. op. cit. 187, fig. II, 5–9; Kom. op. cit. 115, Fig. 3; 116, Fig. 4; Takeda op. cit. 152, fig. II.

Perennial. Rhizome prostrate, branching, with slender, glabrous, 347 woody shoots, crowned with sterile rosettes of leaves, forming large loose mat, thanks to the tillering of some nodes. Stems numerous, (8)15–25(30) cm long, often ascending or semiprostrate, slender, flexuous and weakly angular, at first arachnoid-tomentose, later somewhat woody and glabrescent in lower half, reddish-brown, with 8–20 leaves. Leaves lanceolate to linear-lanceolate, 3–5 cm long and 3–7 mm wide, acute and sharp-pointed, with hydathode at apex; upper ones almost sessile, lower ones contracted to semiclasping sheath, distinctly bicolored, green and glabrous or finely gray-arachnoid above, drying blackish, thinly white-tomentose beneath; leaves of vegetative shoots and fugacious basal leaves lanceolate, on slender petioles, to 13 cm long, and 10 mm wide. Inflorescence of 3–10 capitula, often branched, and then capitula frequently large, solitary; bracteal leaves of heads many (9–12), lanceolate or ovate-lanceolate, wider than upper cauline leaves, usually 1.5–2.0 cm long and 3–6 mm wide, rarely narrower, up to 3 cm long, acute, densely white-tomentose above, thinly greenish tomentose beneath with prominent white vein, sometimes yellowish-green after drying, forming distinct "star," 2.0–3.5 cm wide, rarely larger. Capitula clustered, 3–5 mm, central and solitary ones up to 8 mm wide. Involucral bracts lanceolate, about 3.5 mm long and 1 mm wide, with acute, often lacerate, dark-brown apex. Florets heterogamous, inner bisexual ones sterile, outer pistillate, fertile, with white pappus, as long as or slightly longer than corolla. Flowering VI–VIII; fruiting VIII–IX.

Damp rocks, talus, outcrops, stony slopes, alpine tundra among Siberian dwarf pine Krummholz.

Far East: Uda area (De Kastri Bay), Ussuri (north and middle Sikhote-Alin), Sakhalin. *General distribution:* Northern Japan, Korea. Described from Japan (Rebun Island). Type in Geneva.

Note. The present species, representing, undoubtedly, a northern offshoot race of *L. japonicum* Miq., was described from different places in its range almost simultaneously and independently by three different authors (Beauverd, 1909; Komarov, 1910; Takeda, 1911). In his later works, Beauverd, on the basis mainly of descriptions (so inadequate in this particular genus and the tribe Gnaphaliaeae in general) and very scanty material (the type specimen of the Komarov species), pointlessly recognized both the subspecies of Takeda ([Beauverd] 1912), and the species of Komarov ([Beauverd] 1913), although he correctly referred them to the *Japonicae* group. Handel-Mazzetti totally confused the issue. Greatly exaggerating the importance of certain peculiarities of the stems of the authentic specimens noted by Komarov (some lignification of the lower part of the stem, which does not always occur, is characteristic of this entire group of species), he not only recognized the separate status of Komarov's species, but also referred it (correctly) to the *Japonicae* group, while incomprehensibly and despite Beauverd he included *L. discolor* Beauv. in the completely unrelated *Alpinae* group. He split *L. sachalinense* (Takeda) Miyabe and Kuda between the two 348 above-mentioned species, considering it a synonym of both! As far as *L. coreanum* Nakai is concerned, it is a later, simple synonym of this species.

3. **L. kurilensis**[†] Takeda in Bull. Soc. bot. Genéve, ser. 2, III (1911) 154; Beauv. Ibid. IV (1912) 23; Hand.-Mazz. in Beih. Bot. Centralbl. XLIV, 2 (1927) 90. —*L. alpinum* β. *sibiricum* Rgl. and Til. in Mém. Soc. nat. Moscou XVII (1895) 104. —*L. linearifolium* Hand.-Mazz. op. cit. 100 pro pl. kamtschat.: Hulten, Fl. Kamchatka III (1929) 164. —*L. kamtschaticum* Kom. Fl. Kamchatki II (1930) 33. —*L. antennarioides* Soczava in Bot. Zhurn. XVII (1932) 194. —*L. juzepczukii* Karav. Konsp. Fl. Yakutii (1958) 167, nom. nud. —*Gnaphalium leontopodium* f. *alpina pygmaea* Herder in Bull. Soc. nat. Moscou XL (1867) 418 p. p. —**Ic.**: Takeda op. cit. 153, fig. III, IV; Beauv. op. cit. 23, fig. IV, 1–II.

Perennial. Rhizome ascending or prostrate, 2–3 cm long, short-branching, woody, densely covered with blackish-brown remains of leaves, with fibrous roots, forming small mats of numerous sterile rosettes of leaves and few stems. Stems solitary or most often four or five (to 10), erect and stiff, 5–15(20) cm high, rarely higher (up to 35 cm), loosely or arachnoid-gray-tomentose, sometimes glabrescent toward end of vegetative growth, and then brownish, in upper part under tomentum, as also on leaves, but not always, with scattered "glands"—glandular swellings of hair bases, with 3–10 leaves. Leaves usually narrowly lanceolate, acute or even acuminate, with hydathode at tip, but sometimes linearly oblong to oblong-spatulate, obtuse and rounded at apex; cauline leaves sessile, more or less clasping, 1–2 cm long and 2–5 mm wide, rarely larger; basal leaves longer and wide, oblong-obovate, to 5(7) cm long and 6–10 mm wide, long-tapering to petiole, thin, loosely or arachnoidly gray-tomentose above, sometimes (in plants of shady and moist habitats) even arachnoid, greenish, turning dark after drying, lighter beneath, densely white- or ashy-tomentose, but, sometimes cauline leaves, in particular, with both sides alike light gray-tomentose, as well as stem. Bracteal leaves 4–11, often five to seven, shorter and wider than upper cauline leaves, lanceolate to ovate-lanceolate, 1–2 cm long, rarely longer, and 4–5 mm wide, somewhat obtuse or acute, shaggy, white-tomentose or slightly yellowish above, but often differing little from upper cauline leaves in color and pubescence, forming "star," 1–3 (rarely to 4 and 5) cm wide. Capitula 3–7(10), 3–6 mm wide, tightly aggregated, solitary capitula sometimes up to 10 mm wide, at anthesis yellowish from protruding corollas. Involucral bracts lanceolate, 3.5–6.0 mm long, loosely tomentose on back, with dark brown, acute, and lacerate tips. Capitula heterogamous or unisexual on same plant, or some stems with staminate florets, others with pistillate ones, in mixed capitula numerous inner
349 florets bisexual, but the few outer ones pistillate; pappus hairs up to

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[†] Mistakenly spelled "kirilense" in Russian text—Sci. Ed.

4 mm long, slightly yellowish, thickened toward apex. Flowering VI–VIII; fruiting VIII–IX.

Rocks, stony slopes, stony and gravelly alpine tundra. —*Arctic*: Andayr (Anadyr and Penzhina basins); *Far East*: Kamchatka (Mt. Ploskaya), Okhotsk (Ayan Range, Dzhugdzhur), Zeya-Bureya (Dussa-Alin), Sakhalin (Shikotan Island). Described from Shikotan Island (Kuril Islands). Type in Tokyo (?).

Note. In its often present, bicolored leaves and a number of other characteristics this above-timberline species is related to *L. discolor* Beauv. and, apparently, is its northern derivative. The plants from Ayan and some from Anadyr are distinguished by their small size, the compactness of the mats, the almost uniformly dense, ash-colored pubescence almost everywhere on the plant, and short bracts, which are almost indistinguishable from the leaves in their pubescence. These differences probably are caused by the extremely severe local conditions of their habitats.

4. **L. leontopodioides** (Willd.) Beauv. in Bull. Soc. bot. Genève, sér. 2 (1909) 371, 374; IV (1912) 19; Hand.-Mazz. in Beih. Bot. Centralbl. XLIV (1927) 159; Kom. and Alis. Opredel. Rast. Dalnevost. Kr. II, 1018. —*L. sibiricum* Cass. in Dict. sc. nat. XXV (1822) 475; DC. Prodr. VI, 276 p. min. p.; Ldb. Fl. Ross. II, 2, 614, excl. pl. alatav.; Turcz. in Bull. Soc. nat. Moscou, XX, No. 3 (1847) 8, 9 (α. *humile,* β. *gracile* and γ. *depauperatum*). —*L. sibiricum* β. *gracile* and γ. *depauperatum* Maxim. Prim. Fl. Amur. (1859) 164. —L. *alpinum* ssp. *sibiricum* var. *depauperatum* Beauv. op. cit. 196. —*L. alpinum* var. *campestre* f. *gracile* Beauv. op. cit. 370, 376. —*Filago leontopodioides* Willd. Phytogr. (1794) 12. —*Gnaphalium leontopodioides* Willd. Sp. pl. III (1804) 1892. —*G. leontopodium* f. *sibirica, genuina, gracilis, depauperata, humilis* Herder in Bull. Soc. nat. Moscou XL, 1 (1867) 418, 419 p. p. —*G. leontopodium* β. *sibirica* Franchet in Bull. Soc. bot. France, XXXIX (1892) 131. —*Antennaria steetziana* Turcz. in Bull. Soc. nat. Moscou, Suppl. No. 1 (1857), p. XXXIX; Korsh. in Tr. Peterb. Bot. Sada, XII, 355, **Ic.**: Beauv. op. cit. 372, fig. II. —**Exs.**: GRF No. 1169 (sub *Antennaria steetziana* Turcz.)

Perennial. Rhizome short, woody, many-headed with numerous flowering and sterile shoots (up to 18), but without sterile rosettes of leaves, forming small but compact mat. Stems erect, rigid, often somewhat woody below, slender, sometimes slightly flexuous, (10)20–25(40) cm high, simple or sometimes branched in inflorescence, as also on whole plant with gray-sericeous or ashy lanate (below inflorescence often yellowish), sometimes flocculose pubescence, densely leafy (up to 30 leaves). Leaves upright, often appressed to stem, linear or linearly lan-

ceolate to narrowly lanceolate, 1.5–4.5 cm long and 2–5 mm wide, acute, with large hydathode at tip, and wide roundish base, sessile, compact, margin often revolute, with prominent vein beneath, uniformly pubescent on both sides or more densely so beneath, ash-colored, green-
350 ish above or almost uniformly colored, or yellowish beneath. Inflorescence depauperate, of three or four (to seven) compactly aggregated capitula or capitula solitary, or in corymb each on separate, peduncle to 2.5 cm long; bracteal leaves of same number as capitula (one to four), hardly distinguishable from upper leaves, linear to narrowly lanceolate, erect, not forming stars. Capitula large, 7–10 mm wide and 6–7 mm high. Involucral bracts lanceolate, 5–6 mm long, white-lanate outside, with acute, colorless or light brown tip. Florets unisexual and plants dioecious, very rarely capitula heterogamous; corolla of staminate florets 3.5–4.5 mm long. Pappus dull white, in pistillate florets longer, 4.5–6.5 mm long. Flowering V–VI; fruiting from mid VI–VIII. (Plate XXII, Fig. 4).

Steppes, steppe and dry meadows, dry stony and rocky steppe, slopes of river valleys and mountains, limestone and talus; shore bluffs, edges and openings of pine forests, sandy pinewoods, open oak forests, dry hazelnut-woods, shrub thickets on dry mountain slopes; coastal sands and sandy places, old fields. —*Eastern Siberia*: Angara-Sayans (southeast, in the west up to Krasnoyarsk), Dauria (south and southeast); *Far East*: Zeya-Bureya (south), Ussuri (south). *General distribution*: Mongolia, northern China and Korea. Described from Baikal. Type in Berlin (?).

Note. In the Trans-Baikal Region and northern Mongolia it sometimes produces hybrids with *L. ochroleucum* var. *conglobatum* (Turcz.) Grub. having characteristics of the latter (the form and the pubescence of the leaves, the size of the capitula), but on the whole resembling more *L. leontopodioides* (Willd.) Beauv. (particularly in the inflorescence). This steppe species occupies a somewhat isolated and unclear position in the genus, although, on the whole, perhaps it comes closest to the *Alpinae* group (*L. ochroleucum* series).

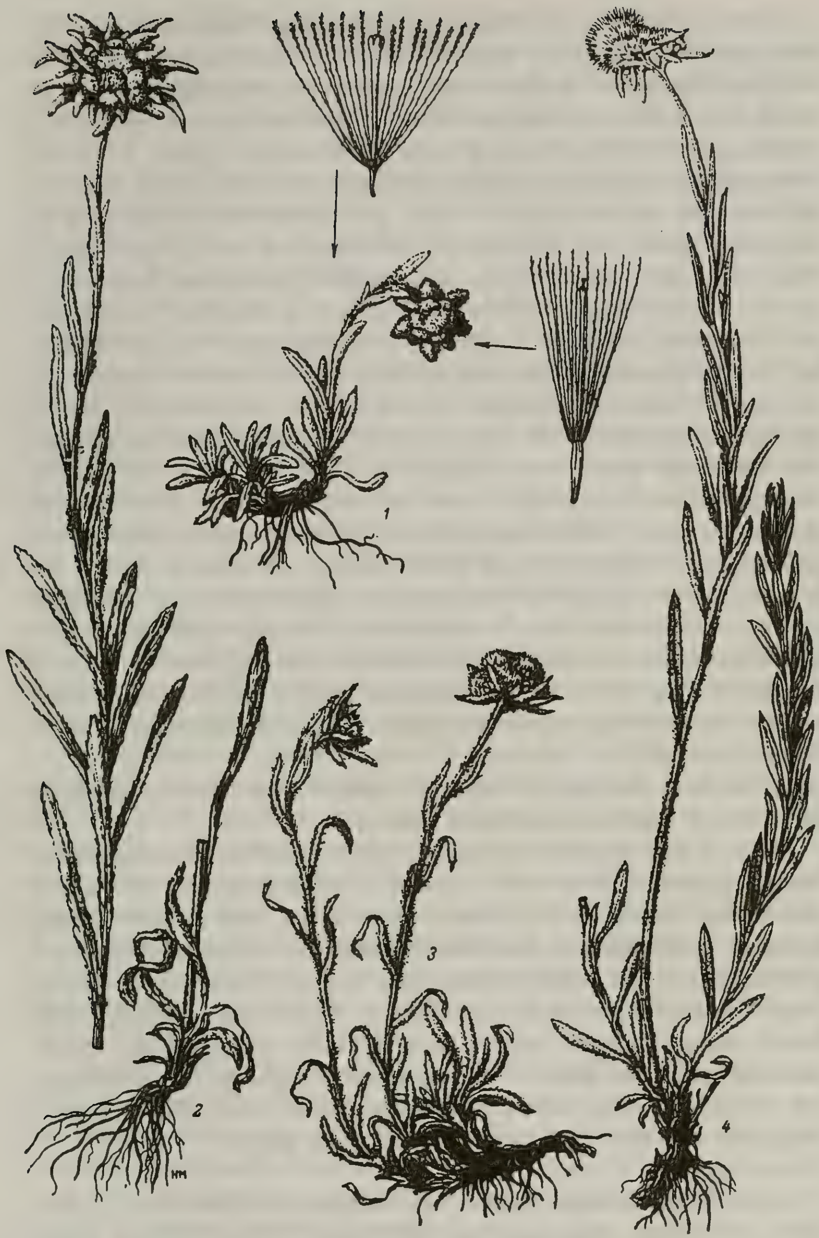
5. **L. ochroleucum** Beauv. in Bull. Soc. bot. Genève, sér. 2, VI (1914) 146. —*L. alpinum* auct. non Cass.: DC. Prodr. VI (1837) 275 p. p. and excl. var.; Trautv. in Bull. Soc. Nat. Moscou XXXIX (1866) 360 p. p.; O. Fedtsch. Tr. Bot. Sada, XXI, 355, XXVIII, 30; Krylov, Fl. Alt. III, 600. —*L. alpinum* var. *subalpinum* Ldb. Fl. Ross. II, 2 (1846) 614; Beauv. op. cit. I (1909) 370, 375; O. and B. Fedtsch. Perech. Rast. Turk. IV, 210. —*L. alpinum* ssp. *subalpinum* var. *subalpinum*, var. *debile*, and var. *hedinianum* Beauv. op. cit. II (1910) 246, IV (1912) 19. —*L. alpinum* var. *sibiricum* O. Fedtsch. in Tr. Bot. Sada XXIV (1905) 134.

—*L. fischerianum* Beauv. op. cit. VI (1914) 143. —*L. leontopodinum* Hand.-Mazz. in Beih. Bot. Centralbl. XLIV (1927) 118; Krylov, Fl. Zap. Sib. XI, 2696. —*Gnaphalium leontopodium* β. *subalpinum* Ldb. Fl. Alt. IV (1833) 56. —*G. leontopodium* f. *alpina pygmaea* Herder in Bull. Soc. Nat. Moscou XL, 1 (1867) 418, pro max. p. (pl. alt. and songor.).
353 —**Ic.**: Beauv. op. cit. p. 250, fig. XXII, 251, fig. XXIII; IV, 143, fig. I; 145, fig. II; Hand.-Mazz. op. cit. 127, fig. 4, **Exs.**: P. Smirnow Pl. alt. exs. No. 86 (sub *L. campestre*).

Perennial. Rhizome short-branching, densely covered with blackish-brown remains of leaf sheaths, forming quite compact mats of numerous stems and sterile rosettes of leaves and sometimes sends out herbaceous, brown-scaly, often branching stolons up to 10 cm long. Stems erect and sturdy, 5–15, rarely up to 25 cm high or undeveloped (f. *pygmaea* Grub.), ashy-arachnoid-lanate or tomentose (in upper half), in lower half sometimes glabrescent, with four to eight remote leaves. Leaves with both sides uniformly grayish-lanate, sometimes glabrate beneath, greenish, without prominent vein; cauline leaves narrowly spatulate, linearly lanceolate or oblong, 1–25 cm [sic..] long and 2–4 mm wide, obtuse or acute, sessile; basal and rosette leaves oblong-spatulate or narrowly oblong, 2–4 cm long and 2.0–4.5 mm wide, tapered to sheath or subpetiolate. Bracteal leaves spreading, oblong-elliptical or broadly lanceolate to narrowly lanceolate, loosely tomentose above, from pale yellow, sometimes even ashy, to sulfur-colored (in dried plant), grayish-lanate beneath, forming quite regular, many-rayed star, 1.5–2.0(2.5) cm wide. Capitula 5–7 mm wide, five to seven (to 12), compactly aggregated; in dwarf, almost stemless form (f. *pygmaea* Grub.), inflorescence sessile, about 1 cm wide, of two or three small capitula, surrounded by short, not so prominent, erect bracts, not longer than capitula. Involucral bracts lanceolate, 4–5 mm long, on back yellowish-lanate or greenish, with prominent, brown or almost black lustrous tip. Capitula heterogamous and unisexual—dioecious; corolla 3–4 mm long; pappus dull white, in sterile bisexual florets 4–5 mm long. Flowering V–VI; fruiting VII–IX. (Plate XXII, Fig. 1).

Alpine tundra, meadows, syrts, kobrezniks, sazas, moraines, rock streams and talus, clayey and stony slopes, gravel beds and dry meadow terraces of streams, damp and marshy banks of brooks in high mountain zone; sedge meadows and marshes, marshy meadows and grassy shores, juniper woodlands, spruce and larch forests, and swampy birch forests in upper reaches of forests zone; from 2,300 to 4,600 m —*Western Siberia*: Altai; *Eastern Siberia*: Angara-Sayans (Sayans); *Soviet Central Asia*: Dzhungaria-Tarbagatai, Pamiro-Alai, Tien Shan. *General distribution*: Dzhungaria-Kashgaria, Mongolia, Tibet.

Described from the Alai Range. Type in Leningrad.



351 Plate XXII.

1—*Leontopodium ochroleucum* Beauv., habit, on top staminate and on right pistillate florets with immature achenes; 2—*L. ochroleucum* var. *conglobatum* (Turcz.) Grub; 3—*L. ochroleucum* var. *campestre* (Ldb.) Grub.; 4—*L. leontopodioides* (Willd.) Beauv.

Note 1. The new combination *Leontopodium leontopodium* (DC.) Hand.-Mazz. proposed by Handel-Mazzetti for this species cannot be accepted because the specific name—*Antennaria leontopodina* DC. on which it is based is a *nomen dubium.* Until the type is established, which plant from northwestern India De Candolle (*Prodr.* VI (1837) 354 269) described under this name will remain unknown. In any case, his diagnosis is not applicable to this particular species, as it is an herbaceous plant with heterogamous capitula, and De Candolle had in mind a semishrub with dioecious capitula (collo suffruticoso multicipiti.... capitula omnino dioica). On the basis of such a diagnosis Turczaninow (1857), Hance (1878), and Korshinsky (1892) presumed that De Candolle had in mind *Leontopodium leontopodioides* (Willd.) Beauv. = *Antennaria steetziana* Turcz. ex Korsh.), which has a many-headed, woody rhizome, firm stems that are slightly woody below, and dioecious capitula. But this steppe plant is not found in northwestern India, nor even in Tibet. Moreover, De Candolle could not have, at one and the same time and in the same paper, diagnosed so differently such close species systematically and habitally, as *Leontopodium ochroleucum* Beauv. and *L. himalayanum* DC. (*Prodr.* VI, 276), and referred them to two different genera—*Antennaria* and *Leontopodium*. Handel-Mazzetti, having specially examined De Candolle's herbarium, does not, however, mention finding the type of *Antennaria leontopodina* DC., and his interpretation of De Candolle's diagnosis of this species is quite unconvincing (Handel-Mazzetti l. c. 127).

Therefore, the specific name *L. ochroleucum* Beauv., given by Beauverd, is legitimate and takes priority.

Note 2. The extreme ecological, almost stemless, cushion-shaped form (f. *pygmaea* Mihi) of this species is morphologically very similar to *L. nanum* (Hook. f. and Thoms.) Hand.-Mazz., and Handel-Mazzetti apparently confused it in part with the latter and in part considered it a transitional form between these two species. However, it has all characteristic features of *L. ochroleucum* Beauv. and is distinguished from *L. nanum* by small capitula, short dull-white pappuses, and usually yellowish-tomentose bracts. Transitional forms between *L. ochroleucum* and *L. nanum* occur, in fact, including also in our Pamir Region (Shugnan), but very rarely; possibly, they are hybrids.

5a. **L. ochroleucum** Beauv. var. **campestre** (Ldb.) Grub. comb. nova. —*L. alpinum* auct. non Cass.: DC. Prodr. VI (1837) 275 p. p. and excl. var. Trautv. in Bull. Soc. Nat. Moscou XXXIX (1866) 360 p. p. —*L. alpinum* α. *campestre* Ldb. Fl. Ross. II (1846) 614 p. max. p.; Beauv. in Bull. Soc. Bot. Genève, sér. 2, I (1909) 370, 376 p. p.; O. and B. Fedtsch. Perech. Rast. Turk., 4, 210. —*L. alpinum* ssp. *campestre* var. *campestre* Beauv. op. cit. (1910) 245, IV (1912) 19, and var. *altaicum* Beauv. op. cit. II (1910) 246 p. p., IV (1912) 19 p. p. —*L. campestre* Hand.-Mazz. in Verh. Zool.-bot. Ges. Wien LXXIV (1924) 28; in Beih. Bot. Centralbl. XLIV (1927) 130; Krylov, Fl. Zap. Sib. XI, 2697. —*L. fedtschenkoanum* Beauv. op. cit. VI (1914) 144; Hand.-Mazz. in Verh. Zool.-bot. Ges. Wien LXXIV (1924) 28. —*Gnaphalium leontopodium* α. *campestre* Ldb. Fl. Alt. IV (1833) 56. —*G. leontopodium* f. *alpina genuina* and ff. *sibirica genuina* and *sibirica humilis* p. p. 355 Herder in Bull. Soc. Nat. Moscou XL, 1 (1867) 417, 418, 419. —**Ic.**: Marret, Ic. fl. alp. pl. III (1924) 15 pl. 429 d No. 1, 2.

Perennial. Rhizome simple, shortened, with solitary stem, or up to 10 cm long, many-headed, densely covered with brown remains of leaf sheaths and beset with fibrous rootlets, usually nonstonloniferous, forming small, loose, bunched mat of several stems and sterile tufts of leaves. Stems (5)15–30 (to 50) cm high, erect or ascending, herbaceous, firm, sometimes weakly flexuous, ashy- or gray-arachnoid-tomentose, or arachnoid, more or less violet pubescence (flocculose as on leaves), by time of flowering, usually glabrescent at least in lower half, uniformly leafy. Leaves 5–20, oblong-linear, linearly spatulate, or linearly lanceolate; cauline leaves sessile, 2.5–4.5 cm long and 2–5 mm wide, by time of flowering, usually shrivelled and drooping; basal and rosette leaves usually narrowly lanceolate, tapered into long petiole, to 15 cm long and 9 mm wide, with both sides identically or almost identically ashy- or grayish-arachnoid-tomentose. Inflorescence generally simple, lax but sometimes corymbosely branched, up to 7 cm wide, of 3–7 separate heads. Bracts linear or linear-lanceolate, strongly unequal, in length, with recurved margins, yellowish or almost white to pale yellow (in dried plants), densely tomentose, forming irregular, many-rayed star up to 4–5 cm wide. Capitula 4–6 mm wide, numerous (7–12, to 20), compactly aggregated; apices of involucral bracts slightly projecting from tomentum, almost transparent, colorless to almost black; capitula heterogamous or unisexual, dioecious. Flowering V–VI; fruiting VI–VIII. (Plate XXII, Fig. 3).

Sheep's fescue and sheep's fescue-wormwood steppes, steppe and solonetzic meadows, steppe and meadow slopes of mountains, dry gravelly and stony crags and ridges of hills, rocks, talus, particularly limestone, peaty sands, pine-forests and their edges in the steppe zone; larch forests and spruce-forests and their edges, forests, sometimes wet-tussock meadows, forest edges in forest zone; juniper woodlands, sazes, moraines, kobrezniks, grassy areas, stony slopes and rocks in lower part of the high mountain zone, up to 2,900 m. —*Western Siberia*: Altai; *Eastern Siberia*: Lena-Kolyma (Stanovoe Plateau, Tommotia, vicinity of Yakutsk), Angara-Sayans (southern half), Dauria; *Soviet Central Asia*:

Dzhungaria-Tarbagatai, Pamiro-Alai, Tien Shan. *General distribution*: Dzhungaria-Kashgaria, Mongolia. Described from the Altai. Type in Leningrad.

5b. **L. ochroleucum** Beauv. var. *conglobatum* (Turcz.) Grub. comb. nova. —*L. sibiricum* β. *conglobatum* Turcz. in Bull. Soc. Nat. Moscou XX, No. 3 (1847) 9; Maxim. Prim. Fl. Amur. (1859) 164. —*L. alpinum* auct., non Cass.; DC. Prodr. VI (1837) 275 p. p. and excl. var.; Meinshausen in Beitr. Kenntn. russ. Reich. XVII (1852) 179; Trautv. and Meyer, Fl. Ochot. phaenog. (1856) 55. —*L. alpinum* α. *campestre* Ldb. Fl. Ross. II (1846) 614 p. min. p. —*L. alpinum* f. *sibirica* Korsh. 356 Tr. Peterb. Bot. Sada, XII (1892) 355. —*L. alpinum* ssp. *sibiricum* var. 1 and 3 (var. *conglobatum*) Beauv. in Bull. Soc. bot. Genève, sér. 2, I (1909) 196. —*L. alpinum* var. *conglobatum* Beauv. ibid. 371, 376. —*L. alpinum* ssp. *alpinum* var. *conglobatum* Beauv. ibid. II (1910) 245. —*L. alpinum* ssp. *campestre* var. *altaicum* Beauv. ibid. II (1910) 246, IV (1912) 19 p. p. —*L. alpinum* ssp. *campestre* var. *conglobatum* Beauv. ibid. IV (1912) 19. —*L. conglobatum* Hand.-Mazz. in Veih. Zool.-bot. Ges. Wien LXXIV (1924) 28; Kom. and Alis. Opredel. Rast. Dalnevost. Kr. II (1932) 1018. —*L. palibinianum* Hand.-Mazz. in Beih. Bot. Centralbl. XLIV (1927) 149, excl. pl. ussur., non Beauv. —*Gnaphalium leontopodium* f.f. *alpina multiflora* and *sibirica humilis* (p. p.) Herder in Bull. Soc. Nat. Moscou XL, 1 (1867) 418, 419, **Exs.**: GRF No. 1027 (sub *L. sibiricum*).

Perennial. Rhizome short, with solitary stem or many-headed, nonstoloniferous, with small bundle of fibrous rootless, forming small tufted mat of few (two or three, rarely more) stems and sterile tufts of leaves. Stems erect and firm (10)15–30(45) cm high, ashy- or grayish-arachnoid pubescent, often almost glabrous, more or less violet or red-brown, uniformly and quite densely leafy. Leaves linearly lanceolate to narrowly lanceolate and linearly spatulate; cauline leaves 2–6 cm long and 2–10 mm wide, erect, upper ones sessile, lower ones long-tapering to base and often marcescent; basal and rosette leaves up to 10 cm long and 13 mm wide, linear-spatulate, long-tapering to petioles, grayish-arachnoid-pubescent to almost glabrous, green above (particularly basal and rosette leaves), finely ashy-arachnoid-tomentose beneath. Inflorescence usually large, often compound, branched, of several heads and more than 30 capitula, but tight, compact, corymbose; capitula usually homogenous, 6–8 mm wide, densely aggregated in heads up to 3 cm wide; bracteal leaves ovate-lanceolate, flat at base, but in upper half with convolute margins, and abruptly narrowed to lanceolate and oblong flat, up to 3 cm long and 10 mm wide, densely tomentose, usually greenish-yellow to yellowish and light ashy above, greenish tomentose beneath, forming "star" up to 7 cm wide; capitula heterogamous or dioecious. Flowering VI–VIII; fruiting VII–IX. (Plate XXII, Fig. 2).

Feathergrass and sheep's fescue-mixed herb steppes, steppe and dry riverine meadows, spruce stands, mountain steppes, steppe slopes, gravelly, particularly calcareous slopes of mountains, hills and river valleys, sandy places, old fields, dry larch forests and pine-forests and their edges. —*Western Siberia*: Altai (rarely transitional forms as well); *Eastern Siberia*: Lena-Kolyma (south up to Vilyuisk and Ust-Aldan), Angara-Sayans (southern), Dauria; *Far East*: Zeya-Bureya (west) *General distribution*: Mongolia (north). Described from Dauria. Type in Leningrad.

Note. I cannot endorse the viewpoint of Handel-Mazzetti, who, 357 although with reservations, raised the three varieties described above to the rank of species, and considered the numerous and diverse intermediate forms simply as their hybrids. It seems to me more correct to treat them as varieties of the same species as did Ledebour, Turczaninow, and even Beauverd. At best, they may be considered as subspecies. Although in their typical manifestation these three varieties are distinguished quite well from each other, they grade inperceptibly into one other, being linked by transitional forms of all degrees of difference. Morphologically, it is impossible to delimit them clearly, and they also are not definitely isolated geographically or ecologically. Their distributions, both geographically and ecologically, overlap widely. Apparently, we have here an example of a still incomplete differentiation of a former single species into species that ecologically and geographically displace each other. Moreover, this process proceeds from east to west and below-upward—from the meadow-steppe var. *conglobatum* to the mountain steppe var. *campestre* and the alpine typical *L. ochroleucum* Beauv., i.e., inversely to their taxonomic pattern.

L. ochroleucum Beauv. var. *campestre* (Ldb.) Grub., as well as the typical *L. ochroleucum* Beauv., is found in the mountain systems of Tien Shan and Pamir-Alai, Dzhungarian Alatau and Tarbagatai, Altai and Sayans and is absent only in Tibet. But unlike the typical variety, specific to the alpine zone, the former is characteristic of the mountain-steppe zone, although there is no distinct altitudinal or ecological boundary between them; completely typical *L. ochroleucum* Beauv. var. *campestre* can also be found in the alpine zone and, on the contrary, typical *L. ochroleucum* Beauv. may be found at quite low altitudes. In eastern Siberia and Mongolia var. *campestre* extends over the steppe areas of the foothills, plateaus and even the "plakors," penetrating in the north to Yakutsk and in the east to Aldan, and here it merges with the third variety, *L. ochroleucum* Beauv. var. *conglobatum* (Turcz.) Grub. This is a more mesophilous meadow-steppe variety, which achieves

unchallenged dominance and its typical appearance farther east in the basin of the upper and middle Amur. Also, there is no obvious boundary between these two varieties throughout the indicated area of eastern Siberia, either in geographical or in ecological terms, and forms transitional between them are as frequent as the varieties themselves. Within var. *campestre,* forms tending toward var. *conglobatum* are found sometimes in the central and eastern Tien Shan. In the Altai forms occur with the typical characters of the latter, as well as intermediate forms. Farther east, typical var. *conglobatum* occurs more and more frequently. In the Tunkin basin, for example, one can find all three varieties with their transitional forms, from typical *L. ochroleucum* Beauv. in alpine tundra to *L. ochroleucum* Beauv. var. *conglobatum* (Turcz.) Grub. on hummocky meadows in the forest zone. In the Mongolian Altai, where the formations of the alpine and montane-steppe zones merge without a clear demarcation, one can observe a direct transition through con-
358 necting forms from typical *L. ochroleucum* Beauv. to var. *campestre* as well as to var. *conglobatum.*

A similar picture is observed on the Vitim plateau where both these varieties produce forms that distinctly tend toward the typical form.

6. **L. brachyactis** Gandoger in Bull. Soc. bot. France XLVI (1899) 420; Beauv. in Bull. Soc. bot. Genèv., sér. 2, I (1909) 196; Hand.-Mazz. in Beih. Bot. Centralbl. XLIV, 2 (1927) 115. —*L. alpinum* auct. non Cass.; Clarke, Comp. Indicae (1876) 100 p. p.; Hooker, Fl. Brit. Ind. III (1881) 279 p. p.; Boiss. Fl. or. suppl. (1888) 293. —*L. alpinum* var. *polyphyllum* Beauv. l. c. op. cit. (1910) 249. —*L. caespitorum* Beauv. op. cit. VI (1914) 147. —*L. margelanense* Beauv. in Schröter, Pflanzenleb. d. Alp. (1924) 504, nomen. —**Ic.**: Hand.-Mazz. op. cit. tab. II, fig. 9.

Perennial. Rhizome short, forming compact mats with a mass of compact sterile leaf rosettes and dense cluster of fibrous roots and producing erect procumbent woody stolons up to 10 cm long, at first loosely leafy, then glabrous, less often not densely covered with light brown remains of leaves. Stems numerous, 4–10, rarely up to 25 cm high, erect and rigid, as also the leaves, densely white-tomentose, but sometimes glabrescent in lower half, dark brown, with four to nine leaves. Cauline leaves oblong-spatulate to obovate, 1.5–2.5 cm long and 2.5–4.5 mm wide, obtuse or sometimes short-acuminate, with hydathode at apex; basal leaves erect, broadly spatulate to rotund-spatulate, 1.5 cm long and 5.5 mm wide, with prominent midrib above, both leaves firm and thick; bracteal leaves 8–12, lanceolate or oblong-linear, acuminate, in color not differing from cauline leaves but more loosely, pubescent, spreading, two to two and one-half times as long as inflorescence and forming star, 1.0–2.5 cm wide. Capitula three to five, compactly aggregated, 6–8 mm wide. Involucral bracts lanceolate, about 5 mm long and 1.5 mm wide, dorsally white-tomentose, with acute, often with erose tip, light or dark brown; capitula heterogamous to dioecious; corolla 2.5–3.0 mm long; achenes about 1 mm long, short-pilose; pappus about 5 mm long. Flowering mid V; fruiting VI–VII?

On rocks and stony slopes, from 1,800 to 3,600 m. *Soviet Central Asia:* Pamiro-Alai (the Alai Range—Lake Kutban-kul, Kul zhai on the Shand River). *General distribution:* Dzhungaria-Kashgaria, Tibet. Described from western Himalayas (Tihri Garhwal). Type in London (?).

Note. This xerophilous western Himalayan montane species was found in the USSR only in a very small territory, isolated from its main range, on the northern slope of the Alai Range. It is easily distinguished from its close relatives, *L. nanum* (Hook. f. and Thoms.) Hand.-Mazz. and *L. ochroleucum* Beauv., by rather thick, spatulate leaves with a prominent midrib, glabrous, slender, woody stolons and uniform light 359 ashy pubescence on all plant parts. Contrary to Handel-Mazzetti's indication, I did not find forms truly transitional to *L. nanum* (Hook. f. and Thoms.) Hand.-Mazz.

7. **L. nanum** (Hook. f. and Thoms.) Hand.-Mazz. in Beih. z. Bot. Centralbl. XLIV, 2 (1927) 111. —*Antennaria nana* Hook. f. and Thoms. in Clarke Comp. Indicae (1876) 100; Hooker, Fl. Brit. Ind. III (1881) 278. —*L. alpinum* auct. non Cass.: Clarke l. c. p. p.; Hooker, op. cit. 279 p. p. —*L. monocephalum* Klatt. in Nova Acta Leop.-Car. Akad. Naturf. XLI (1880) 373 p. p. —*L. alpinum* subsp. *sibiricum* var. *monocephalum* Beauv. in Bull. Soc. bot. Genèv., sér. 2, I (1909) 196. —*L. alpinum* var. *subalpinum* f. *monocephalum* Beauv. op. cit. (1909) 375. —× *L. jamesonii L. alpinum* var. *campestre* × *L. monocephalum* Beauv. op. cit. IV (1912) 38. —*L. jamesonii* Hand.-Mazz. in Schröter, Pflzleb. d. Alp. (1924) 505; in Verh. Zool.-bot. Ges. Wien LXXIV (1924) 27. —**Ic.**: Hand.-Mazz. in Beih. z. Bot. Centralbl. XLIX, 2 (1927) Taf. II, 11–17.

Perennial. Forming small mats; rhizome short, up to 2 cm long, densely covered by brown remains of leaves with dense basal sterile rosettes of leaves and numerous fibrous rootlets, producing one to five creeping and branching brown scaly stolons up to 10 cm long. Stems solitary, less often 2–3, usually up to 5 cm high, rarely higher, with three to seven leaves, covered, as also entire plant, with light gray, loose, tomentose pubescence, more or less violet underneath, often acaulescent and then plant, together with sessile heads, not exceeding 1.5–2.0 cm in length. Leaves oblong-spatulate to spatulate and oblong; basal leaves up to 2 cm long and 5 mm wide; cauline leaves erect, up to 1.5 cm long and narrower, equally pubescent on both sides; bracteal leaves not distinguishable from cauline leaves, upright, not exceeding head, and more often shorter and not forming star. Head very compact, 6–15 mm wide, of three, rarely five capitula; more often capitula solitary, large; involucral bracts lanceolate, about 6 mm long, slender-acuminate and scarious at apex, brown to almost black, dorsally often green; capitula unisexual—dioecious or heterogamous; florets with very long white pappus; in staminate florets corolla 4 mm long, pappus 6 mm long; in pistillate florets corolla 6 mm, pappus 8–9 mm long; pappus slightly exceeding corolla and involucral bracts, forming prominent, compact, little white cap. Flowering mid V–VI; fruiting VI-mid VIII.

Alpine shore meadows and damp clayey and gravelly slopes from 3,500 to 4,800 m. —*Soviet Central Asia*: Pamiro-Alai (valley of the Kara-Dzhilga River). *General distribution*: Dzhungaria-Kashgaria, Tibet. Described from Kashmir. Type in London.

Note. It is a well isolated Tibetan alpine species which does not intergrade with the closely related species *L. ochroleucum* Beauv. and *L. brachyactis* Gdgr. In a thorough examination of the herbarium material preserved in Leningrad with Handel-Mazzetti's determinations, I 360 did not find most of the transitional forms mentioned by him; in fact, the majority of them represent one of the forms of *L. ochroleucum* (see the note to *L. ochroleucum* Beauv.).

8. **L. alpinum** Cass. in Dict. Sc. nat., XXV (1822) 474; DC. Prodr. VI (1837) 275 pro pl. europ.; Beauv. in Bull. Soc. bot. Genève, sér. 2, I (1909) 196, 375, p. p.; Hegi, Ill. Fl. VI, 1 (1918) 458; Schröter, Pflanzenleben d. Alp. (1924) 500; Hand.-Mazz. in Beih. Bot. Centralbl. XLIV (1927) 141. —*Gnaphalium leontopodium* L. Sp. pl. (1753) 855 excl. pl. sibir.; Willd. Sp. pl. III (1804) 1892 and auct. pl. —*Filago leontopodium* L. Sp. pl. (1763) 1312 excl. pl. sibir. —*Antennaria leontopodium* Gaertn. De fruct. et sem. pl. II (1791) 410. —*Simlera alpina* Bubani, Fl. Pyren. II (1900) 197.—**Ic.**: Rchb. Ic. Fl. Germ. XVI tab. CMXLVII, II; Hegi, op. cit. tab. 261, 3–3d, textf. 232. —**Exs.**: Fl. exs. Austro-Hung. No. 3778.

Perennial. Rhizome short and thick, ascending, densely covered with dark brown remains of leaf sheaths, simple or short-branching, with numerous fibrous roots, producing solitary stems or less often, tufted mats of flowering stems and a few sterile rosettes of leaves. Stems erect, simple, 3–10 cm high, rarely higher, white-lanate, with five to eight leaves. Leaves linear- or oblong-spatulate to spatulate; cauline leaves 1.5–2.0 cm long and 2.5–6.0 mm wide; basal and rosette leaves up to 5 cm long and 9 mm wide, obtuse, rarely cauline leaves short-acuminate, sessile, lower cauline and rosette leaves narrowed to broad sheath, upright or slightly spreading, green or white-arachnoid above, along margin white-bordered because of tomentum projecting out from beneath, finely and densely tomentose beneath, pure white with prominent midrib. Bracteal leaves numerous, narrowly ovate or narrowly triangular-ovate, acute or obtuse, rarely narrower, thick, snow-white tomentum above forming beautiful many-rayed "star" 2.0–3.5 cm wide (rarely bigger), sometimes inflorescence branched, of several little "stars"; capitula compactly aggregated, 5–12, rarely solitary, 5–8 mm wide. Involucral bracts 4–5 mm long, white-lanate outside with dark brown upright tip; capitula heterogamous; pappus white, about 4 mm long; achenes pilose. Flowering VI–VII; fruiting VII–IX.

On rocks and ledges, on outcrops of limestone and shale, in gravelly places, alpine and subalpine mountain zones. —*European Part*: Upper Dniester (eastern Carpathians: Blizhnitsa, Petros, Goverla, Mezhipotoka mountains). *General distribution*: Central Europe, western Mediterranean, Balkans. Described from western Europe. Type in London.

Note. An alpine species of the Alps mountain system, closely related to the series *L. ochroleucum* Beauv., but completely isolated from it both morphologically and geographically. It can be considered actually as a geographical vicariant of *L. ochroleucum* Beauv. s. str. in western Europe.

361

GENUS 1489. **Anaphalis** DC.[1,2]

DC. Prodr. VI (1837) 271.

Capitula many-flowered, 3–10 mm wide, subglobose, campanulate or more or less infundibuliform, arranged in corymbiform or corymbiform-paniculate, branched inflorescences, rarely capitula solitary or in clusters of two or three in inflorescence. Involucral bracts white-scarious or snow-white to pink and reddish, basally often greenish or brownish, from outer ovate to lanceolate or linear inner ones, imbricately arranged in three to eight rows, upright or somewhat spreading; outer bracts shorter, dorsally and basally tomentose sessile, middle sometimes tapered into rostellum, sometimes lacerate, inner bracts narrowest, entire or fimbriate-toothed. Receptacle glabrous, subconvex or flat, sometimes somewhat acute, alveolate, without scales, less often with membranous scales. Plants dioecious or almost so with 3 types of flowers: in some plants capitula have predominantly pistillate florets,

[1] Treatment by A.G. Borissova.

[2] Anagram of the genus name *Gnaphalium*.

with up to 10, less often to 20 sterile bisexual florets in middle of capitulum; in other plants capitula only with staminate florets and abortive ovary; pistillate florets, in several outer rows, fertile, narrowly tubular, filiform, sometimes with two to four filiform teeth at apex, pappus hairy, more or less smooth or weakly scabrous; style of pistillate florets bifid, usually exserted from corolla; sterile bisexual florets with expanded campanulate corolla with five small teeth, abortive ovary and stamens, pappus of weakly barbed, scabrous free hairs, entire or slightly bifid stigma almost as long as corolla; staminate florets with abortive ovary, more or less broadly campanulate corolla with five small teeth, and pappus of plumose or weakly plumose free hairs dilated at apex; stamens scarcely exserted, basally sagittate, syngenesious, caudate because of slender appendages at base of anthers; stigma simple and obtuse, less often with two very short lobes; achenes (in pistillate florets) 0.75–1.25 mm long, oblong, somewhat cylindrical, sessile, without rostellum, smooth or scabrous, sometimes glandular; sterile bisexual florets and sometimes staminate florets with rudimentary achene; pappus in all types of florets consists of one row of free deciduous hairs, uniform in a given floret, thin, almost smooth or weakly scabrous at tip in pistillate florets, thinly and finely plumose in sterile florets and plumose or plumosely thickened at tip in staminate florets. Dwarf semishrubs or perennial low herbs with woody rhizome or thick often peeling woody root; stems usually simple, less often weakly branched, 362 basally woody, gray- or white-tomentose or pubescent; leaves alternate, entire, sessile or decurrent, less often petiolate, oblong-ovate to linear, upper leaves sometimes scarious at tip or apiculate.

Type species: *A. nubigena* DC. growing in the Himalayas.

About 35 species of the genus are distributed in the tropical and temperate zones, mostly in montane habitats of Asia; one species grows in North America. In the USSR, the representatives of this genus are found mainly in Soviet Central Asia and two species in eastern Siberia.

1. Capitula in terminal clusters of one to three, quite large, 8–10 mm wide. Herbs about 10 cm high, with woody slender rhizome; leaves with scarious processes at apex (Zeravshan, Alai, Darvaz ranges)..............1. **A. serawschanica** (Winkl.) B. Fedtsch.

+ Capitula in corymbiform, corymbiform-paniculate or capitate inflorescences, quite large (8–10 mm or perhaps 3–5 mm wide). Dwarf semishrubs, usually with robust woody root; stems many; leaves without scarious processes, acute or with short, rather thick, sharp point, or more or less obtuse............................2

2. Robust plants, 30–60 cm high; leaves 5–10 cm long, 3–12 mm wide, linear or linear-lanceolate, subcoriaceous, subglabrous

or sparsely arachnoid pubescent above, white- or brownish-pilose or -tomentose beneath. Inflorescence 4–12 cm wide; capitula snow-white, 8–10 mm wide (Far East)............................ ....2. **A. margaritacea** (R. Br.) Benth. and Hook. f.

+ Herbs or dwarf semishrubs, less robust; leaves 1–4(5) cm long, 0.5–10.0 mm wide, usually pubescent on both sides................3

3. Herbaceous plants with slender stems and woody, rather slender root; leaves lanceolate or oblong-lanceolate, less often linear-lanceolate; pappus hairs of staminate florets plumosely broadened at tip...4

+ Semishrubs with rather thick stems and robust, woody, often peeling roots; leaves linear or linear-lanceolate or oblong-lanceolate, but then densely white-tomentose, often with broadened base; pappus hairs of staminate florets plumose or somewhat plumosely broadened at tip (Soviet Central Asia)......5

4. Leaves 3–5 cm long, 4–10 mm wide, arachnoid-pilose above, sometimes subglabrous, tomentose beneath, short-petiolate or sessile, cuneately narrowed to base; capitula 3–7 mm wide (Far East)..3. **A. possietica** Kom.

363 + Leaves about 2 cm long, about 3 mm wide, on both sides sparsely tomentose, but less above, somewhat broadened to base and amplexicaul. Capitula about 8 mm wide and 5 mm long (Darvaz)..4. **A. tenuicaulis** Boriss.

5. Densely and fimbriately tomentose plants with rather thick stems; leaves oblong-lanceolate, lanceolate, or linear-lanceolate, with broadened base; capitula 8–10 mm wide................................6

+ Almost glabrous, bluish-green or whitish from tomentose pubescence of plants, with virgate slender stems; leaves linear, not broadened at base or lanceolate-linear with broadened base, but then involucre whitish-pink; capitula about 10 mm or perhaps 3–5 mm wide...7

6. Involucral bracts four- or five-rowed, subacute, white; leaves linear-lanceolate or lanceolate, 2–4 cm long, 2–7 mm wide; achenes 1.5 mm long, 0.5 mm wide, glabrous, smooth (Tien Shan)...5. **A. velutina** Krasch.

+ Involucral bracts seven- or eight-rowed, obtuse, white and pink; leaves lanceolate or oblong-lanceolate, 2.0–2.5 cm long, 2–6 mm wide; achenes about 1 mm long, 0.25 mm wide, brown, scabrous (Darvaz)...............................6. **A. depauperata** Boriss.

7. Leaves lanceolate or linear-lanceolate with broadened base; involucral bracts whitish-pink; capitula about 5 mm wide....... ....10. **A. roseo-alba** Krasch.

+ Leaves linear or linear-lanceolate, not broadened to base........8

8. Capitula about 10 mm wide 9

+ Capitula 3–5 mm wide 10

9. Stems densely white-tomentose; involucral bracts from outer ovate to inner oblong and linear-lanceolate, acute or more or less obtuse; stigma not exserted from corolla; pappus longer than corolla (Tien Shan) ....7. **A. racemifera** Franch.

+ Stems sparsely pilose, subglabrous, glabrous below; involucral bracts lanceolate to narrowly lanceolate; stigma exserted from corolla; pappus as long as corolla or shorter (Pamiro-Alai, Garan) ....8. **A. garanica** Boriss.

10. Plants densely leafy with numerous sterile shoots, almost half as long as fertile shoots; leaves 1.0–2.5 cm long, linear; outer involucral bracts oblong, others oblong-lanceolate, obtuse or subobtuse; achenes oblong, 0.75 mm long, brownish (Vakhan, Darvaz, Shugnan, Zeravshan ranges) ....9. **A. virgata** Thoms.

+ Leaves more or less remote or densely leafy but sterile shoots not numerous and almost as long as fertile shoots; leaves linear-lanceolate, 3–4 cm long, 3–5 mm wide, or linear, 1.5–4.0 cm long, 364 1–4 mm wide; outer involucral bracts oblong-lanceolate or lanceolate, inner to linear; achenes 1.0–1.25 mm long ....11.

11. Achenes 1.0 mm long, 0.5 mm wide, oblong-ovoid; pistillate and staminate florets about 3 mm long; involucral bracts oblong-lanceolate, three- or four-rowed; leaves 3–4 cm long, 3–5 mm wide, for the most part upright; plants densely tomentose and densely leafy (Shugnan, Darvaz) ....11. **A. darvasica** Boriss.

+ Achenes 1.25 mm long, 0.3 mm wide, sublanceolate; pistillate and staminate florets 4–5 mm long; involucral bracts five- or six-rowed, from outer lanceolate to inner linear; leaves (1.5)2–4 cm long, 1–4 mm wide, recurved; sparsely leafy, almost glabrous plants (Shugnan) ....12. **A. scopulosa** Boriss.

Section 1. ANAPHALIS Boriss. sect. nova in Addenda XXIV, 589. — § 1 DC. Prodr. VI (1837) 272; Ser. A. subsect. (a) sect. *Himalayanae* Clarke, Comp. Ind. (1876) 101 p. p. —Capitula terminal in clusters of one to three, rather large, 8–10(12) mm wide; low herbs with woody slender rhizome; leaves with scarious process at apex.

Besides *A. serawschanica* (Winkl.) B. Fedtsch., this section includes *A. nubigena* DC. (syn. *A. monocephala* DC.), growing in the alpine zone of the Himalayas in India.

1. **A. serawschanica** (Winkl.) B. Fedtsch. in Izv. Peterb. Bot. Sada 2 (1905) 55; O. and B. Fedtsch. Perech. Rast. Turk. IV, 208; B. Fedtsch.

Rast. Turk. 733. —*Antennaria serawschanica* Winkl. in Tr. Peterb. Bot. Sada X, 1 (1887) 88.

Perennial. Rhizome woody, slender, with slender roots; stems strongly branched from base and woody, about 10 cm high, densely leafy, sterile and fertile, grayish from dense, long white pubescence. Leaves semiamplexicaul, sessile, lanceolate, 1.5–2.0 cm long, 3–5 mm wide, gray-tomentose with appressed hairs, entire, more or less acute with scarious processes at the tip about 1.0–1.5 mm long. Capitula with predominantly pistillate florets about 10 mm wide, in terminal clusters of two or three; receptacle convex, alveolate, glabrous. Involucral bracts imbricate, four- or five-rowed, scarious, outermost bracts ovate, dark brown, white along margin, dorsally and at base densely lanate-tomentose, middle bracts much more elongate, inner bracts lanceolate, brownish at base, in upper part whitish or pinkish. Pistillate florets filiform, about 7 mm long, filiformly five-toothed, shorter than pappus of fine almost smooth hairs; stigma deeply bifid, exserted from corolla; central florets 10–20, bisexual, sterile, about 7 mm long, with campanulately expanded, glandular, five-toothed limb, with exserted, 365 bifid, weakly bifid or entire stigma, with pappus of scabrous hairs, slightly longer than corolla. Capitula with staminate florets about 8 mm wide; staminate florets about 6 mm long, five-toothed, campanulate-tubular, with exserted staminal tube, undeveloped style, shorter than anthers. Pappus with apically plumose hairs, almost as long as corolla; achenes lanceolate-oblong about 1 mm long. Flowering VII–VII. (Plate XXIII, Fig. 2).

Mountain slopes. —*Soviet Central Asia*: Pamiro-Alai (Zeravshan, Alai, Darvaz ranges). Endemic. Described from Lake Kuli-Kalan. Type in Leningrad.

Section 2. POLYCEPHALOS Boriss. sect. nova in Addenda XXIV, 589. — § 2 et § 3 DC. Prodr. VI (1837) 272, 274; ser. A. subsect. (b) sect. *Himalayanae* Clarke, Comp. Ind. (1876) 102, p. p.; Sect. *Peninsulares* Clarke ibid. 102 p. p. —Capitula in corymbiform, paniculate-corymbiform, and capitate inflorescences, 3–5 mm or 8–10 mm wide. Dwarf semishrubs, less often herbaceous plants, usually with robust woody root; stems numerous; leaves without scarious processes at apex, acute, mucronate, or obtuse.

Species of this section are distributed over Asia, particularly in the Himalayas and in India.

Series 1. Margaripes (DC.) Boriss. comb. nova. —Sect. *Margaripes* DC. Generis Antennaria DC. Prodr. VI (1837) 270; subsect. (b) sect. *Himalayanae* Clarke, Comp. Ind. (1876) 102, p. p. —Coarse semishrubs with simple erect stems; leaves 5–10 cm long, coriaceous, subglabrous above, white- or brownish-pilose or tomentose beneath; inflorescence 4–12 cm wide; capitula 8–10 cm wide with snow-white involucres; pappus hairs of staminate florets not expanded at apex.

Besides *A. margaritacea* (R. Br.) Benth. and Hook. f., this series includes *A. cinnamomea* Benth., *A. triplinervis* Sims. and other species.

2. **A. margaritacea** (R. Br.) Benth. and Hook f. Gen. II (1873–1876) 303; Kom. and Alis. Opredel. Rast. Dalnevost. Kr. II, 1023. — *Antennaria margaritacea* R. Br. in Transact. Linn. Soc. XII (1818) 123, nomen; R. Br. in DC. Prodr. VI (1837) 270; Lessing in Linnaea VI, 222; Hook. Fl. bor. Amer. I, 329; Torrey and Gray, Fl. bor. Amer. II, 429; Ldb. Fl. Ross. II, 2, 613. —*Gnaphalium margaritaceum* L. Sp. pl. (1763) 1198; Georgi Beschr. d. Russ. Reich. III, 4, 1237. —*Helichrysum margaritaceum* Mönch. Meth. (1794) 576. —**Ic.**: Miyoshi and Makino, Pocket-Atlas alp. pl. Jap. II, tab. 51, fig. 292 (1907); Hegi, Ill. Fl. VI, 1, 495 (1915).

Perennial. Rhizome rather slender, woody with numerous roots, for the most part horizontal; stems herbaceous, erect or ascending, simple or almost so, 30–60 cm high, somewhat thick, rather densely leafy, white-arachnoid-tomentose. Leaves linear-lanceolate or linear, 5–10 cm long, 3–12 mm wide, acute or acuminate, glabrous, or sparsely
366 arachnoid above, grayish-green, white-tomentose or brownish-pilose beneath, one-, less often three-veined, sessile, semiamplexicaul and slightly decurrent; lower leaves sometimes approximate, more or less clustered. Inflorescence corymbiform or corymbiform-paniculate, 4–12 cm wide; peduncles of inflorescences tomentose; capitula many, 8–10 mm wide. Involucral bracts five- to seven-rowed, scarious, more or less entire, obtuse; outer bracts ovate, about 3 mm long, middle ones ovate to oblong, 4–5 mm long; innermost bracts narrowly lanceolate, 4 mm long; all involucral bracts white, outer bracts pubescent at base and with small brownish spot, which increases in innermost bracts up to three-fourths of bract. Receptacle conical, broadly conical, tuberculate. Pistillate florets filiform-tubular, about 5 mm long with filiform teeth and glands; stigma deeply bifid, exserted; pappus of fine deciduous hairs somewhat exceeding corolla; capitulum with pistillate florets has a few bisexual, sterile florets in middle, about 4.5 mm long, campanulate-tubular, with exserted bifid stigma, pappus of fine, deciduous, weakly scabrous, hairs; in other plants capitulum with staminate florets; 3.0–3.5 mm long, numerous, with campanulate-tubular corolla, scarcely exserted staminal tube, black hairs at tip; pappus of weakly scabrous hairs, almost as long as corolla, stigma entire, shorter than corolla; achenes

tiny, linear-lanceolate, 0.75 mm long, about 0.25 mm wide, ribbed and scabrous from fine appressed bristles. Flowering VII–VIII.

Coniferous and birch forests, on dry soils. —*Far East*: Kamachatka (and Commander Islands), Okhotsk, Zeya-Bureya, Uda River area, Ussuri, Sakhalin (and Kuril Islands). *General distribution:* Indo-Himalayas, Japan, China, North America. A widely introduced plant in Europe. Described from Canada. Type in London.

Series 2. Tenuicaules Boriss. —Stems slender, herbaceous, glabrous or subglabrous; leaves lanceolate or oblong-lanceolate, pubescent or subglabrous; capitula 3–8 mm wide; pappus hairs of staminate florets plumosely expanded, flat at apex.

3. **A. possietica** Kom. in Izv. Bot. Sada Akad. Nauk SSSR, XXX (1932) 218; Kom. and Alis. Opredel. Rast. Dalnevost. Kr. II, 1023. —Kom. and Alis. ibid., Plate 305.

Perennial. Rhizome long, horizontal, slender, woody; stems erect, simple, 20–30 cm long; grayish from dense arachnoid pubsecence, glabrous only at base or glabrescent later, densely leafy. Leaves remote, lanceolate or oblong-lanceolate, 3–5 cm long, 4–10 mm wide, upper leaves more or less appressed to stem, upright, middle and lower leaves spreading, entire, one-veined, acute or mucronate, on both sides (less
367 above) pubescent, tomentose beneath, arachnoid-pilose above, sometimes subglabrous, on very short petioles or sessile, cuneately narrowed to base. Inflorescence corymbiform or corymbiform-paniculate; bracteal leaves narrowly linear, acuminate. Capitula, 20–25, 3–7 mm wide, dry, silvery-white, subsessile on short white-tomentose peduncles. Involucral bracts four-rowed, white; outer bracts ovate, middle oblong, inner lanceolate, obtuse and rounded at apex, unevenly blunt-toothed, lustrous beneath, dull in upper part, at base with darker spot and pilose. Receptacle tuberculate, covered with chaffy, oblong-elliptical bracts; pistillate florets slender-tubular, five-toothed, with lanceolate glandular teeth; stigma with two recurved linear lobes exserted from corolla; pappus slightly longer than corolla, of one row of fine, scabrous, free, subequal hairs; central florets bisexual, sterile, few. Staminate florets tubular bisexual, sterile, with abortive ovary, narrow, five-toothed corolla; stamens shorter than corolla, syngenesious, anthers with sharp-pointed basal appendages; stigma bifid with fimbriate lobes; pappus longer than florets, with scabrous hairs plumosely expanded at tip. Achenes (in pistillate florets) obliquely oblong, about 1 mm long, 0.3 mm wide, somewhat expanded and with concave ring at base, apically expanded in a ring, with finely papillose surface. Flowering VII–VIII.

Mountain slopes, among thickets of wormwood. —*Far East:* Ussuri (Posyet Region, Mt. Cherepakha, Furugel'm Island in Peter the Great Bay). Endemic, possibly also found in the adjoining regions of Korea and China. Described from the Posyet Region. Type in Leningrad.

4. **A. tenuicaulis** Boriss. sp. n. in Addenda XXIV, 589.

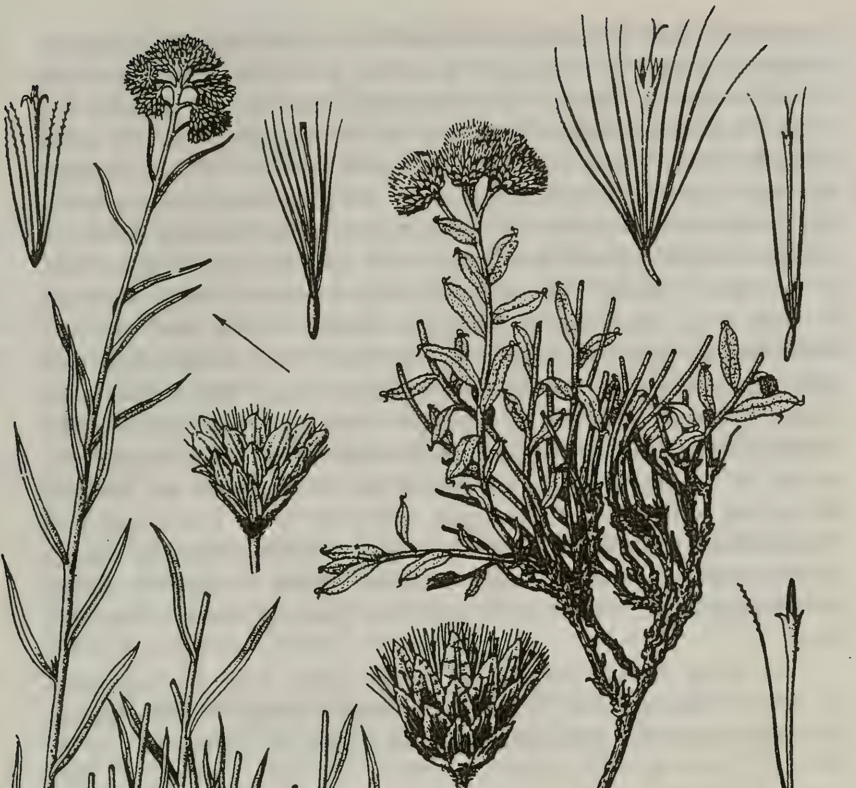
Perennial. Herbs with long, woody, slender root, having numerous lateral rootlets. Stems slender, numerous, 18–20 cm high, basally woody and brownish, erect or ascending, rather densely leafy, sparsely tomentose-pilose or subglabrous above. Leaves alternate, more or less upright, sessile, oblong-lanceolate, less often linear-lanceolate, usually about 2 cm long, 3 mm wide, acute and acuminate, entire, somewhat expanded at base and amplexicaul; thin, on both sides (less above) sparsely tomentose; inflorescence corymbiform-paniculate, 1.5–3.0 cm wide, branched above, with 3–20 capitula on very slender tomentose peduncles; capitula with staminate florets about 8 mm wide and 5 mm long. Involucre, four-or-five-rowed, spreading; involucral bracts from ovate and oblong outer to oblong-lanceolate inner, all obtuse, sometimes unequally lacerate-toothed, 368 white in upper part, brownish and tomentose at base. Receptacle convex, alveolate. Staminate florets about 4 mm long, campanulate-tubular with five-toothed limb, sometimes with several glands outside, with pappus almost as long as corolla, of plumosely expanded hairs at tip; anthers and style included in corolla tube and reaching only to two-thirds length of corolla or somewhat shorter than it; anthers with long, filiform appendages; style entire at tip, with long hairs (under magnifying glass). Plants with pistillate florets unknown. Flowering VIII.

Stony mountain slopes. —*Soviet Central Asia:* Pamiro-Alai (Darvaz). Endemic. Described from Darvaz. Type in Leningrad.

Series 3. Velutinae Boriss. —Velutinous-tomentose, dwarf semishrubs with more or less thick stems; leaves with expanded base; capitula 8–10 mm wide; pappus hairs of staminate florets plumose but not expanded.

5. **A. velutina** Krasch. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, IX, 4–12 (1946) 152.

Perennial. Dwarf semishrubs; root robust, woody, peeling. Stems not many, erect, thick rigid, branched from middle, 30–40 cm high, very densely gray- or white-velutinous and arachnoid-tomentose from soft hairs, often floccose. Leaves numerous, more or less appressed to stem, erect, sessile, lanceolate or linear-lanceolate, 2–4 cm long, 2–7 mm wide at base, short-acuminate with very short, hardly visible dark cusp,



369 Plate XXIII.

1—*Anaphalis racemifera* Franch., habit, staminate floret, pistillate floret with achene, capitulum with pistillate florets; 2—*A. serawschanica* (Winkl.) B. Fedtsch., habit, on left—capitulum with pistillate and sterile bisexual florets, on right—capitulum with staminate florets, sterile bisexual floret, pistillate floret with achene, staminate floret.

expanded at base. Inflorescence corymbiform or corymbiform-paniculate, compact, terminal on stems and branches; peduncles of inflorescences densely tomentose, more or less thick, short. Capitula with pistillate florets 8–10 mm wide and 5–6 mm long and with staminate florets 6–8 mm wide. Involucral bracts compactly imbricate, four- or five-rowed, white scarious; outer bracts more or less acute or obtuse, sometimes lacerate at tip; in capitula with pistillate florets, involucre almost equaling florets, in staminate capitula shorter than florets; inner involucral bracts linear, more or less acute, densely white-tomentose at base; middle and inner bracts 5–7 mm long, lanceolate, all bracts becoming divergent later. Pistillate florets about 5 mm long, filiform-tubular, four- or five-toothed; style with bifid stigma almost as long as corolla; pappus longer than corolla, hairs
371 weakly scabrous; in center of capitulum there are two-to-five bisexual, sterile, more broadly tubular florets with pappus of apically plumose hairs, as long as corolla; with reduced anthers and entire stigma, not exserted; all corollas with glands in upper part. Staminate florets 4 mm long, with five-toothed, campanulate-tubular corolla and exserted stamens, pappus of free, deciduous hairs, apically plumose, almost as long as corolla. Achenes oblong, 1.5 mm long, 0.5 mm wide, glabrous, smooth. Flowering VI–IX.

On rocks, along riverbeds in woody shrub zone of mountains. — *Soviet Central Asia:* Tien Shan (Chatkal Range, Talass Alatau). Endemic. Described from Chatkal Range. Type in Leningrad.

6. **A. depauperata** Boriss. sp. n. in Addenda XXIV, 590.

Perennial. Dwarf semishrubs, woody at base, with long woody root having numerous, slender, lateral rootlets. Stems more or less thick, numerous, 15–30 cm high, densely leafy, whitish, as also whole plant, densely tomentose. Leaves alternate, more or less upright, sessile, amplexicaul, lanceolate or oblong-lanceolate, sometimes linear-lanceolate, somewhat expanded at base, 2.0–2.5 cm long, 2–6 mm wide, entire, more or less acute, sometimes tip with short, dark cusp, white-tomentose on both sides, one-veined. Inflorescence corymbiform-capitate, 1.5–3.0 cm wide, 1–3 cm long, with 3–15 capitula on thickened tomentose peduncle. Capitula with pistillate florets, 8–10 mm wide, about 8 mm long; involucre seven- or eight-rowed; outer involucral bracts ovate, middle bracts oblong, inner ones lanceolate or spatulate-lanceolate with brown spot in middle and green base, apically white or pink, scarious, all bracts obtuse, in lower part long tomentose-pilose, somewhat divergent, as long as florets; pistillate florets greenish, filiform-tubular, about 5 mm long, with short teeth and glands at apex, stigma bifid exserted from corolla and with spreading branches; pappus of fine scabrous hairs, as long as corolla; in center of capitulum, along with predominantly pistillate florets, there are five or six bisexual, sterile, campanulate-tubular florets, about 5 mm long, with pappus of scabrous-plumose hairs equaling corolla, with entire stigma and staminal tube, almost as long as corolla or slightly exserted. Capitula with staminate florets 6–7 mm wide, with ovoid-oblong, subacute involucres; staminate florets about 4 mm long, campanulate-tubular, five-toothed, glandular, with staminal tube at apex, more or less not exserted and entire stigma not exserted from corolla, pappus of plumose hairs, somewhat longer than or as long as corolla. Achenes about 1 mm long, 0.25 mm wide, brown, scabrous. Flowering VII.

372 In alpine and subalpine zones, stony slopes and landslides, at 2,800 m. —*Soviet Central Asia*: Pamiro-Alai (Darvaz). Endemic. Described from Darvaz. Type in Leningrad.

Note. It is possible that the plants growing in the Fergana Range in Kugart Pass belong to this same species.

Series 4. Racemiferae Boriss. —Dwarf semishrubs, whitish-tomentose or subglabrous; leaves linear and narrowly linear, not broadened at base; capitula about 10 mm wide; pappus hairs of staminate florets plumose but not expanded above.

7. **A. racemifera** Franch. Pl. du Turk. (1883) 87; O. and B. Fedtsch. Perech. Rast. Turk. IV, 208; B. Fedtsch. Rast. Turk. 733. —*A. leptophylla* auct. fl. As. Med. non DC.: O. and B. Fedtsch. Perech. Rast. Turk. IV (1911) 208. —*Helichrysum buhseanum* auct. fl. As. Med. p. p. non Boriss.

Perennial. Dwarf semishrubs; root robust, woody, peeling. Stems numerous, 30–60 cm high, flower-bearing, woody below, erect, densely leafy, white or whitish from dense tomentum. Leaves alternate, almost appressed to stem, sessile, linear, (1.5)2.0–4.5 cm long, 1–3 mm wide, entire, often convolute, with one prominent nerve, tip acute and with very short, brownish, glabrous cusp, slightly tapered to base, on both sides with soft white-tomentose pubescence. Inflorescence compact, capitate, corymbiform or racemose-paniculate with crowded capitula, or sometimes lower branches of inflorescence remote and elongated with capitula aggregated at branch tips in axils of upper leaves; inflorescence peduncles densely tomentose. Capitula about 10 mm wide and 8 mm long, predominantly with pistillate florets, and two to five sterile, bisexual florets in center, basally tomentose, on short tomentose peduncles. Involucres imbricate, five-rowed, white-membranous, at the very base and sometimes up to middle tomentose; outer bracts ovate or oblong, inner ones oblong or lanceolate to linearly lanceolate, about 6 mm long, 1 mm wide, somewhat tapered toward apex, acute or more or less

obtuse, sometimes serrate-lacerate, along margin and in upper half white-papery, from middle to base brownish-greenish, somewhat recurved at maturity of achenes, exceeding floret; receptacle alveolate, glabrous. Pistillate florets narrowly tubular, about 5 mm long, shorter than involucre and pappus; stigma not exserted; pappus of uniform, scabrous, deciduous and free hairs, slightly longer than corolla; sterile, bisexual florets with broadly tubular five-toothed corolla, apically glandular, with pappus of plumose hairs somewhat exceeding corolla. Staminate capitula on other plants, smaller, 5–7 mm wide; staminate florets not as long as involucre, about 4 mm long, campanulate-tubular, with five divergent teeth, and
373 stamens slightly exserted from corolla tube; pappus somewhat shorter than corolla, about 3.5 mm long; pappus hairs plumose in upper part, scabrous from tiny hairs. Achenes developing only in pistillate capitula, oblong, 1.25 mm long, about 0.5 mm wide, brown, glabrous, almost smooth. Flowering VI–IX. (Plate XXIII, Fig. 1).

Stony slopes and talus, in walnut forests and in stony steppes, at 1,400–1,800 m. —*Soviet Central Asia*: Tien Shan (western and central Tien Shan, Fergana, Susamyr and Chatkal ranges, Kirgizian Alatau). Endemic. Described from the Karakiz River, a tributary of the Pskem River which meets Chatkal. Isotype in Leningrad.

8. **A. garanica** Boriss. sp. nova in Addenda XXIV, 591.

Perennial. Dwarf semishrubs, basally woody. Stems virgate, 30–40 cm high, sparsely pilose above, subglabrous below. Leaves 2–3 cm long, 1–4 mm wide, linear and narrowly linear, acuminate with short cusp, tomentose on both sides, more densely beneath, sometimes convolute. Inflorescence corymbiform-paniculate, compact and many-flowered; bracteal leaves linear, about 0.5 mm long, acuminate, glabrous beneath (outside), tomentose-pilose above. Pistillate capitula about 10 mm wide, 7 mm long, on slender peduncles, puberulent; involucre four- or five-rowed, lanceolate to narrowly lanceolate, whitish in upper part, greenish in lower part, membranous, with hyaline margin; outer bracts brownish, base with lax, intertwined pilose hairs, more or less obtuse, sometimes lacerate-toothed; receptacle deeply alveolate with membranous scales; pistillate florets about 5.5 mm long, filiform-tubular, glandular in upper part, with exserted bifid stigma having long divergent branches; pappus hairs fine plumose throughout, almost as long as or slightly shorter than corolla; in center of capitulum with predominantly pistillate florets there are two or three bisexual, sterile florets with campanulate-tubular, five-toothed corolla, about 5 mm long, glandular in upper part, with pappus, almost as long as corolla, of finely plumose hairs; staminal tube almost as long as corolla. Achenes in pistillate florets about 1 mm long, narrowly oblong (immature), truncate on both sides. Flowering VII.

On stony slopes, river banks, at 2,400 m. —*Soviet Central Asia:* Pamiro-Alai (Garan). Endemic. Described from Garan, from the Pyandzh River. Type in Leningrad.

Series 5. Virgatae Boriss. Subsect. (c, d) sect. *Himalayanae* Clarke, Comp. Ind. (1876) 102, p. p.; sect. *Peninsulares* Clarke ibid. p. p. — Dwarf semishrubs, grayish-green or whitish from short arachnoid or 374 tomentose pubescence, sometimes glabrous in lower part; leaves linear or lanceolately linear, expanded at base or not; capitula 3–4 mm wide; pappus hairs of staminate florets plumose, not expanded above.

9. **A. virgata** Thoms. in Clarke, Comp. Ind. (1876) 107; Boiss. Fl. or. Suppl., 294; Hook, Fl. Brit. Ind. III, 285. —*Helichrysum buhseanum* auct. fl. As. med. non Boiss. p. p.

Perennial. Dwarf semishrubs, woody at base, with robust, woody, peeling root, numerous virgate, erect or ascending, slender, densely leafy, white-tomentose flowering stems branched above, 20–40(50) cm high; sterile shoots numerous, considerably shorter. Leaves linear, sessile, 1.0–2.5 cm long, pubescent on both sides, acute, with or without very short cusp. Inflorescence compact, corymbiform or paniculate-corymbiform, terminal, often with elongated lower branches. Capitula 3–4 mm wide, upper capitula on short and lower on long peduncles, globose-campanulate, numerous; receptacle alveolate, glabrous; outer involucral bracts oblong, others lanceolately oblong, from base up to middle tomentose and brown or brownish, toward apex glabrous, whitish, somewhat obtuse, 3–4 mm long. Pistillate florets about 3 mm long, narrowly tubular, with exserted bifid stigmas; pappus hairs fine, as long as corolla; two to four central florets sterile, bisexual broadly tubular, with glands at tip, with pappus hairs short-plumose at tip and slightly longer than corolla. Staminate florets about 3.5 mm long, narrowly campanulate-tubular, with limb of five lanceolate teeth, at apex glandular with inconspicuously exserted staminal tube and entire abortive stigma; pappus of short-plumose hairs, somewhat shorter than corolla. Achenes oblong, about 0.75 mm long, brownish. Flowering VII–X.

Stony mountain slopes, at 2,500–3,000 m. —*Soviet Central Asia*: Pamiro-Alai (Vakhan, Darvaz, Shugnan and Zeravshan ranges). *General distribution:* Iran Region (Afghanistan), Dzhungaria-Kashgaria, Tibet (western). Described from western Tibet. Isotype in Leningrad; type in London.

Series 6. Scopulosae Boiss. —Dwarf semishrubs, grayish-green or whitish from short, arachnoid or tomentose, often crisped pubescence; capitula 4–5 mm wide; pappus hairs of staminate florets plumosely expanded.

10. **A. roseo-alba** Krasch. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, IX, 4–12 (1946) 152. —*A. aurora* Rech. f. and Edelb. in Dan. Biol. Skr. 8, 2, Symb. afg. II (1955) 27; —**Ic.**: Rech. ibid. fig. 18.

375 Perennial. Dwarf semishrubs, woody at base; (15)20–40 cm high. Stems numerous, slender, erect or ascending, with short branches above, densely leafy, with many short-shoots and leaves in axils, grayish-green from short pubescence. Leaves somewhat spreading to horizontally spreading, lanceolate to linear-lanceolate, 1.5–2.5 cm long, 5–10 mm wide, with maximum width at base, flat, acute with cusp, densely appressed tomentose-lanate beneath, more loosely so above. Inflorescence paniculate-pyramidal or capitate-corymbiform, terminal on stems and branches. Pistillate capitula almost campanulate globose, about 5 mm wide, staminate capitula 4–5 mm wide. Involucral bracts imbricate, four- or five-rowed, membranous, whitish and pink, acute; outer bracts ovate-oblong, white-tomentose, brownish at base, on back convex, margin scarious, sinuate-toothed, apically sometimes lacerate, often glandular; middle bracts lanceolate, at base with long and loosely pilose hairs, at apex scarious; inner bracts linear, as long as florets or almost so. Receptacle alveolate, glabrous. Pistillate florets narrowly tubular, not exceeding involucre, at apex glandular, as long as pappus, with fine scabrous hairs; two to four central florets bisexual, sterile, broadly tubular, apically glandular, with pappus almost equaling corolla, pappus hairs plumose in upper part; stigma bifid, exceeding corolla. Staminate florets campanulate-tubular with five recurved teeth, glandular; stamens exceeding corolla; pappus shorter than corolla, with hairs plumose or clavately expanded at tip. Achenes dark brown, oblong, 1 mm long and about 0.5 mm wide, loosely short-pilose, glandular. Flowering VII–IX.

Stony slopes, rocks, talus, in the zone of woody-shrubby vegetation, in the zone of juniper and sheep's fescue steppes, at 1,800–3,500 m. —*Soviet Central Asia:* Pamiro-Alai (Gissar, Zeravshan, Alai, Turkestan, Vakhsh and Darvaz ranges). *General distribution:* Iran Region (Afghanistan). Described from the Gissar Range. Type in Leningrad.

11. **A. darvasica** Boriss. sp. n. in Addenda XXIV, 591.

Perennial. Rhizome stout, woody, long, with thin, filiform lateral roots. Stems numerous, strongly woody from base, brownish and glabrous, in middle part light grayish from dense, crisped, tomentose and arachnoid pubescence, erect or slightly ascending, simple, 40–60 cm high, densely leafy. Leaves alternate, directed upward and to sides, sessile, linear-lanceolate, 3–4 cm long, 3–5 mm wide, acute, with thick short 376 cusp, entire, on both sides tomentose, more densely beneath, with numerous axillary shoots having two to five tiny leaflets. Inflorescence corymbiform-paniculate, diffuse, bushy; bracteal leaves linear, 5–10 mm long, about 1 mm wide, acute. Capitula numerous, 4 mm long, 3 mm wide, on short-tomentose peduncles. Involucral bracts three- or four-rowed, white-membranous in upper one-third part, in remaining part arachnoid on outer side from yellowish, intertwined hairs, oblong-lanceolate; middle and inner bracts about 3 mm long, outer about 2 mm wide and about 3 mm long, sometimes brownish in middle, entire, apically rounded, sometimes lacerate or uneven. Florets white, dry ones brownish or yellowish, tubular; pistillate florets tubular, slender, but not filiform, finely toothed; style scarcely longer than corolla, with weakly bifid stigma; pappus about 3 mm long of fine scabrous hairs, almost equaling corolla; one or two central florets bisexual, sterile, with weakly developed staminal tube included in five-toothed corolla; pappus as long as corolla or almost so, with hairs plumosely broadened in upper part. Staminate capitula about 5 mm long, 3 mm across, staminate florets about 3 mm long, almost as long as pappus of apically expanded and plumose hairs; corolla campanulate-tubular with five-toothed lobe; stamens scarcely exserted from corolla. Achenes oblong-ovoid, 1 mm long, 0.5 mm wide, dark brown. Flowering VII–IX.

Stony and rubbly mountain slopes, rocks, at 2,000–3,500 m. — *Soviet Central Asia:* Pamiro-Alai (Shugnan, Darvaz). Endemic. Described from Shugnan. Type in Leningrad.

12. **A. scopulosa** Boriss. sp. n. in Addenda XXIV, 592.

Perennial. Dwarf semishrubs, woody at base, with long woody root. Stems virgate, numerous, 30–50 cm high, in lower part glabrous, more or less pilose above, sometimes with pilose bands below leaf bases, finely glandular, with axillary shoots. Leaves alternate, upright, more or less remote, sessile, linear-lanceolate or linear, (1.5)2–4 cm long, 1–4 mm wide, entire, often convolute, one-nerved, acuminate, with glabrous cusp about 1 mm long, glaucescent from tomentose pubescence on both sides, sometimes with floccose tomentum. Inflorescence corymbiform or corymbiform-paniculate, 1.5–7.0 cm wide, with numerous capitula on whitish-tomentose peduncles. Involucre exceeding florets, five- or six-rowed, imbricate; involucral bracts from outer lanceolate ones to inner linear ones, snow-white, from middle to base greenish-yellowish, membranous-hyaline, at base tomentose; inner bracts glandular, bluntish. Pistillate capitula, 4–5 mm wide; pistillate florets about 4 mm long, narrowly tubular, glandular at tip, with few teeth, stigma bifid, 377 scarcely exserted; pappus hairs scabrous, as long as corolla; three to five central florets bisexual, sterile, with campanulate, tubular, five-toothed corolla, about 3 mm long, with stigma exserted from corolla, with two short and thick branches; stamens and pappus of plumose hairs almost as long as corolla. Staminate florets about 4–5 mm long, campanulate-tubular, with five spreading teeth, glandular at tip, with entire stigma shorter than stamens; staminal tube almost as long as or shorter than corolla; anthers with filiform, basal appendages; pappus as long as corolla, with plumosely expanded hairs. Achenes oblong, about 1.25 mm long and 0.3 mm wide, brown, obtuse, smooth. Flowering VIII.

Stony slopes, crevices in rocks, at 2,000 m.—*Soviet Central Asia:* Pamiro-Alai (Shugnan). Endemic. Described from Shugnan. Type in Leningrad.

GENUS 1490. **Lasiopogon** Cass.[1,2]

Cass. in Bull. Soc. philom. (1818) 75; Hoffm. in Pflzfam. IV, 5 (1897) 187

Capitula heterogamous, discoid or ovoid, many-flowered, aggregated in globose heads surrounded by closely abutting bracteal leaves, in terminal cymes. Involucre one- or two-rowed, bracts slightly longer than florets, thin, membranous, margin hyaline, in middle greenish. Receptacle flat, glabrous. Peripheral florets in capitulum pistillate, numerous, tubular, almost filiform, with three- or four-toothed corolla. Disk florets bisexual, tubular, few, fertile, with four- or five-toothed corolla; anthers with basal appendages; achenes obovoid or obovoid-oblong, somewhat compressed, glabrous, with pappus of one row of long-plumose bristles. Annual dwarf herbs, lax-branching from base, lanate, forming small cushions.

A Mediterranean genus comprising two species growing on dry sandy places, slopes and stony areas in southeastern Spain, northern and southern Africa, eastern Iran, and Afghanistan.

The Genus *Lasiopogon* is close to the genus *Gnaphalium* L., from which it differs chiefly by the pappus consisting of long-plumose bristles and by the two-rowed involucre. In the members of the genus *Gnaphalium* the bristles are only scabrous, and the involucre is many-rowed.

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[1] Treatment by L.A. Smoljaninova.

[2] The name is derived from the Greek words *lasios*—villous, and *pogon*—beard, indicating the very long-plumose pappus bristles.

1. **L. muscoides** (Desf.) DC. Prodr. VI (1837) 246; Willk. and Lange 378 Prodr. Fl. Hisp. II, 53; Boiss. Fl. or. III, 224; Karjagin, Fl. Apsh. (1952) 371. —*Gnaphalium muscoides* Desf. Fl. Attl. II (1800) 267. —**Exs.**: Bourgeau Pl. d'Espagne (1852) No. 1605. —**Ic.**: Desf. op. cit., tab. 231; Karjagin and Prilipko in Dokl. Akad. Nauk Azerb. SSR, III, 11 (1947) 511, Fig. 1.

Annual. Dwarf plants, 3–12 cm high, densely gray or white-lanate, much branched from base, with numerous, slender, forking, prostrate, small shoots, forming small, flat, compact cushions. Leaves small, 4–7 mm long and 2 mm wide, alternate, approximate, narrowly spatulate or linear, obtuse, entire. Capitula small, ovoid, aggregated in numerous, compact, small, globose heads in terminal cymes surrounded by closely abutted bracteal leaves, almost as long as heads, oblong-spatulate, with very heavy tomentose pubescence of long, gray hairs. Involucre two-rowed; involucral bracts of almost equal size, 2–3 mm long and 0.3–0.7 mm wide, in middle greenish, margin scarious, thin, white, hyaline, lustrous; outer bracts lanceolate, somewhat obtuse, dorsally covered with long white hairs; inner bracts narrowly spatulate, glabrous, at apex rounded or barely emarginate. Florets tubular, yellowish, in upper part reddish; peripheral florets pistillate, numerous (up to 50), in two or three whorls, with corolla 1.3–2.0 mm long and 0.1 mm wide, filiform, three-toothed (sometimes four-toothed), with three glands on each tooth; stigma bifid, stigma lobes 0.25 mm long, lanceolate, glabrous, at apex somewhat blunted; ovary narrowly obovoid or ovoid, slightly curved, not equal-sided, 0.3–0.5 mm long and 0.1–0.2 mm wide, glabrous; pappus of few, long-plumose bristles 1.3 mm long; disk florets five or six, bisexual, fertile, with corolla 1.5–1.7 mm long, in upper part expanded, 0.3 mm wide, glabrous, four-toothed (sometimes five-toothed); teeth of limb, 0.1 mm long, margin very finely papillose; ovary ovoid, 0.5–0.6 mm long and 0.1 mm wide, glabrous; pappus one-rowed, of few, readily deciduous, 1.5–2.0 mm long, white, long-plumose bristles; stamens four or five, anthers ovoid, tapering to tip, 0.75 mm long and 0.1 mm wide, with short, acute, caudate, basal appendages, glabrous, syngenesious, surrounding pistil, filaments of stamens free, short, 0.5 mm long; stigma bifid, its branches 0.75 mm long, truncate, racemose, at apex papillose. Achenes, small, 0.5–0.6 mm long, narrowly obovoid or ovoid, glabrous. Flowering IV–V.

Dry sandy and stony places. —*Caucasus*: Eastern Transcaucasia. *General distribution*: Western Mediterranean (southeastern Spain, northern Africa), South Africa (Cape Province), eastern Mediterranean (Arabia), Iran, Afghanistan.

Note. In the Soviet Union this species was collected in the fruiting stage by the geologist K.F. Gridnev in the Baku Region (on Zhiloe Island) in April 1947.

379 GENUS 1491. **Phagnalon** Cass.[1,2]

Cass. in Bull. Soc. Philom. (1819) 174

Capitula solitary, diclinous, discoid, i.e., without ligulate florets, with several whorls of female florets and bisexual florets. Involucre campanulate or ovoid; involucral bracts many-rowed, imbricate, subulate or oblong-lanceolate, at apex membranous; outer bracts smaller, receptacle flat, glabrous, tuberculate. Florets yellow, all fertile; outer pistillate florets filiform, with two or three tiny teeth; style as long as floret, with slender obtuse branches; bisexual florets tubular with five-toothed limb, with style branches expanded at apex, truncate or almost capitate; base of stamens entire or sagittate. Achenes small, somewhat flat, not ribbed, slender, almost cylindrical, glabrous or pubescent; pappus of one row of fine hairs, persistent (or caducous?). Dwarf semishrubs, tomentose or lanate, less often glabrous, perennial herbs; leaves alternate entire or slightly sinuate-toothed. This genus comprises dozens of species growing in the Mediterranean Region, on the Canary Islands and in West Asia.

1. Leaves 2–3 cm long, oblong-obovate, glossy above, glabrous beneath, with short thick cusp. Capitula 5–11 mm long; outer involucral bracts 4–5 mm long, lanceolate, inner bracts 10–11 mm long, narrowly lanceolate, long-acuminate (Darvaz)..1. **P. darvasicum** Krasch.

+ Leaves 6–8 mm long, 1–2 mm wide, oblong-lanceolate, sparsely pilose above, densely white-tomentose beneath. Capitula 7–9 mm wide; outer involucral bracts almost glabrous, 1.0–1.5 mm long, oblong-lanceolate; inner bracts 7–8 mm long, lanceolate, brownish-reddish, along margin whitish; after flowering all bracts withering (Greater Balkans).......................2. **P. androssovii** B. Fedtsch.

1. **P. darvasicum** H. Krasch. in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, III (1936) 343; Fedtsch. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, IX (1946) 185; Linczevsky, ibid, XI (1949) 173. —*P. glaberrimum* Rech. f. in Dan. Biol. Skr. 8, No. 2 (1955) 34. —**Ic.**: Rech. Ibid. fig. 23, 24.

Perennial. Rhizome many-headed; stems 10–22 cm high, slender, more or less branched or simple, glabrous, sometimes glandular above. Leaves somewhat thick coriaceous, punctate-glandular, glossy, with 380 impressed nerves above, with prominent midrib beneath, oblong-obo-

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[1] Treatment by A.G. Borissova.

[2] Anagram of the generic name *Gnaphalon*.

vate, 2–3 cm long, more or less contracted at base, with short, thick cusp at tip, margin convolute, entire or with one to three teeth on both sides. Peduncles two to four, elongated, leafless or with one or two small leaves, 1–7 cm long, arising from one of axils of upper leaves; capitula solitary, 5–11 mm long. Involucre imbricate, three- or four-rowed; involucral bracts glabrous, weakly ciliate, with much darker midrib; outer bracts 4–5 mm long, linearly lanceolate, inner 10–11 mm, narrow, filiform-linear, long-acuminate and membranous at tip. Peripheral florets female, narrowly filiform, in several whorls; central florets bisexual, tubular, five-toothed. Pappus of one row of bristles (four or five), about 4–5 mm long. Fruiting VIII.

Stony mountain slopes, crevices in rocks, at 1,000–1,500 m. — *Soviet Central Asia*: Pamiro-Alai (Darvaz). Endemic. Described from Pyandzh Region from Alekseenko's collection. Type in Leningrad.

Note. This species was collected for the second time in 1935 in the Dashti-Dzhum Region in the Zarbuts River basin, in Zarbuts Canyon (Linczevsky and Maslennikova).

2. **P. androssovii** B. Fedtsch. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, IX (1946) 185; Linczevsky, ibid., XI (1949) 173.

Perennial. Plants 10–15 cm high, more or less dwarf semishrubs; root hard, more or less thick, root collar highly branching. Stems numerous, at base woody; annual stems erect or somewhat ascending, simple or weakly branched, very densely appressed white-pilose, up to two-thirds leafy. Leaves sessile, oblong-lanceolate, 6–8 mm long, 1–2 mm wide, entire or with indistinct small teeth, recurved, sparsely pilose above, densely white-pilose beneath. Capitula at tips of stems and branches, solitary, more or less globose, 7–9 mm wide. Involucre many-rowed; outer bracts more or less glabrous and short, 1.0–1.5 mm long, oblong-lanceolate, margin white-membranous; middle longer, glabrous, lanceolate, acute, longer; inner ones lanceolate, acuminate, 7–8 mm long, brownish-reddish, margin whitish; after flowering all involucral bracts withering. Florets and achenes unknown.

Soviet Central Asia. mountainous Turkmenia (Greater Balkans; Parkhai Ravine near Kara-Kala). Described from Turkmenia from the mountains of Greater Balkans, near the village of Dzhebel. Type in Ashkhabad.

Note. It differs from the closely related species *P. rupustre* (L.) DC. by the form of its involucral bracts.

It was described from a single specimen, located in Ashkhabad. In addition, there are M.G. Popov's collections, preserved in the Tashkent herbarium.

381 GENUS 1492. **Gnaphalium** L.[1,2]

L. Sp. pl. (1753) 850, p. p. *Cyttarium* Peterm. Fl. Lips. exc. (1838) 608, p. p. —*Filaginella* Opiz. Sezna, (1852) 44. —*Dasyanthus* Bub. Fl. Pyren. II (1900) 198

Capitula heterogamous; a few bisexual florets in center, the rest pistillate, numerous, usually in few or many rows, less often one-whorled. Small capitula aggregated in compound spicate inflorescence or small capitula, forming compact corymb (the so-called "glomerule"); only rarely capitula on plant total one to three. Involucral bracts herbaceous or dry and scarious, variously colored, imbricate, many-rowed. Receptacle flat or convex, glabrous, alveolate. Pistillate florets filiform, slightly toothed or short three- or four-fid at apex. Bisexual florets tubular, at apex almost always with five, often glandular teeth or lobes. Anthers linear, basally sagittate, with caudate appendages; pollen grains spherical, with narrow or broad furrows, oval or round pores and spinulose exine. Style usually swollen at base; style branches linear, truncate. Achenes usually oblong or cylindrical, covered with white (transparent) papillae or stiffer hairs, rarely glabrous; pappus one-rowed, of separate, fine hairs or thicker bristles, sometimes falling singly or a few together, other times united at base in distinct ring. Base chromosome number: $x=7$.

Annual, biennial, or perennial plants, sometimes more or less woody at base and often hoary from tomentose-lanate pubescence covering them; leaves alternate, entire, sessile or semiamplexicaul or leaf base attenuated into more or less long petiole.

The genus *Gnaphalium* L. s. l. includes about 300 species, distributed in all parts of the world, but is represented particularly well in Central and South America (more than half of all species).

Lectotype: *Gnaphalium uliginosum* L.

Note. The question of the size and limits of the genus *Gnaphalium* has been the subject of repeated discussions, but there still is no fully satisfactory solution. Concise information on the history of study of *Gnaphalium* and on the principles of the systematics of the Gnaphalinae as a whole are given in the article by M.E. Kirpicznikov and L.A. Kuprianova entitled "Morphological, geographical, and palynological data for understanding the genera of subtribe Gnaphalinae" (*Tr. Bot. Inst.* 382 *Akad. Nauk SSSR*, Ser. 1, 9, 1950, pp. 7–37). For the *Flora of the USSR*, the genus *Gnaphalium* is viewed in a broader sense than in the above-mentioned work.

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[1] Treatment by M.E. Kirpicznikov.

[2] From the Greek word *gnaphalon*—felt, wool (the name indicates the tomentose-lanate pubescence characteristic of many species of the genus *Gnaphalium*).

The representatives of the genus *Gnaphalium* growing not only in the USSR but also in western Europe have repeatedly drawn the attention of foreign scientists. Together with certain successes achieved by the researchers the synonymy has become extraordinarily large. We will not present the total synonymy here, but refer those who are interested to the meritorious compilation of J. Briquet and F. Cavillier (in Burnat, *Flore des Alpes Maritimes*, VI, 2, 1917, Lyon).

Economic Importance: Exotic (American) cudweeds are sometimes cultivated as ornamental plants. For species growing in the USSR, see below in the descriptions.

1. Annual (very rarely biennial) plant; pappus hairs fine, falling separately or in groups of few..........2

+ Perennials. Pappus hairs usually connate at base in a distinct ring, only rarely hairs (bristles) relatively thick and free, falling separately..........11

2. Involucral bracts membranous, lustrous, bright lemon yellow and golden or straw-colored to whitish..........3

+ Involucral bracts herbaceous, grayish or brown..........4

3. Involucral bracts bright lemon yellow or golden; capitula small, mostly 2–3 mm wide; pappus hairs yellowish. Introduced plant, sometimes found in Transcaucasia..........***G. affine** D. Don

+ Involucral bracts straw-colored to whitish. Plant quite widely distributed in the European Part of the USSR, as well as in the Caucasus and some regions of Soviet Central Asia..........8. **G. luteo-album** L.

4. Stem densely and thickly white-tomentose; leaves oblong-obovate or oblong-spatulate; pitillate florets in capitulum about 150. Plant of the southern half of the European Part of the USSR and southern half of Western Siberia..........4. **G. rossicum** Kirp.

+ Stem not so densely and thickly pubescent, but hairs more or less spreading or floccose; leaves more linear; pistillate florets in capitulum fewer..........5

5. Squat plant with stem (1)3–6 cm high, at base up to 1 mm thick, not or weakly branched, not densely pubescent. Rarely found in the northwest of the European Part of the USSR..........7. **G. uliginosum** L.

+ Plant larger, usually with stem 12–15 cm or more high, at base about 1 mm thick or much thicker..........6

6. Pistillate florets in capitulum (fully developed) about 125..........7

383 + Pistillate florets in capitulum about 75..........8

7. Stem 25–35 cm high, covered with white, floccose tomentum, at base 2.0–3.5 mm thick and woody; small branches diverging from stem at acute angle. Plant not prostrate. In the USSR found only in the Far East..1. **G. tranzschelii** Kirp.

+ Stem 12–15 cm high, more or less glabrous and often reddish in lower half (particularly at base), at base 1.0–2.5 mm thick; small branches of main stem often arcuate. Baikal-Daurian Region..3. **G. baicalense** Kirp.

8. Plants more or less uniformly pubescent..................................9

+ Plants not uniformly pubescent; lower half of stem (or at least its base) glabrous or subglabrous..10

9. Plant grayish-green or whitish, spreading pubescent throughout; leaves linearly lanceolate, petiolate, often more or less falcate, 2–5 cm long and 1.5–3.0 mm wide. Species occurring in the west and north of European Part of the USSR..7. **G. uliginosum** L.

+ Whole plant gray-green or grayish-whitish from tomentum, which is not dense; withering lower leaves not deciduous and, as a rule, together with abortive shoots, forming a unique rosette near root collar. Plant of Kazakhstan and Altai-Dzhungaria regions...6. **G. kasachstanicum** Kirp.

10. Capitula in dense glomerules; leaves 2–3 cm long and 2–3 mm wide. Plant widely distributed throughout the northern half of Siberia..5. **G. sibiricum** Kirp.

+ Capitula in sparse glomerules, sometimes solitary; leaves half as long and wide as in previous species. Plant of the Amur and Ussuri river systems...........................2. **G. mandshuricum** Kirp.

11. Pappus hairs (bristles) free, i.e., not connate at base into ring. Low plants, (1)5–12(18) cm high, confined mainly to the alpine and subalpine zones but also occurring in mountain tundras and in the Arctic...12. **G. supinum** L.

+ Pappus hairs connate at base into ring. Plant taller.............12

12. Capitula in comparatively long spicate inflorescence, often about half as long as entire plant; leaves with only one distinct, central vein; involucral bracts usually light brownish or straw-colored, with brownish spot or band in upper part. Plant usually 20–60 cm high, widely distributed in forest zone, mainly in the European Part of the USSR and western Siberia...9. **G. sylvaticum** L.

384 + Spicate inflorescence, as a rule, shorter; some leaves often with three distinct veins; involucral bracts usually with broad and dark- or blackish-brown band. Plant mostly 10–25 cm high,

distributed in alpine and subalpine zones, but sometimes also in mountain tundras and in the Arctic..13

13. Basal leaves with three distinct veins. In the USSR, plants mostly occurring in subalpine zone but also in mountain tundras and in the Arctic Region.................................10. **G. norvegicum** Cunn.

+ Basal leaves with only one distinct vein. In the USSR, plants found only in the Caucasus Mountains...11. **G. caucasicum** S. and L.

Subgenus 1. **Gnaphalium**. *Gnaphilium* L. emend. Kirp. in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, 9 (1950) 32. —Sect. *Eugnaphalium* DC. Prodr. VI (1837) 222, p. p. —Capitula clustered in so-called glomerules, these sometimes in turn forming a spicate or corymbose inflorescence; only very rarely glomerules sparse, or only one or two axillary capitula; pappus of fine filiform hairs, not connate at base into ring, falling separately or in groups of a few hairs; pollen grains 14.5–15.5 (rarely up to 17 mm) in diameter, with narrow and shallow furrows, oval pores and short, broadly conical spinules. Annual or, rarely, biennial plants not reaching high in the mountains.

Type of subgenus is type of genus.

Section 1. GNAPHALIUM. —Sect. *Eugnaphalium* DC. Prodr. VI (1837) 222, p. min. p. —Involucral bracts herbaceous, grayish or brownish.

Type of section is type of genus.

1. **G. tranzschelii** Kirp. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XIX (1959) 352; Kirp. and Kupr. in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, 9 (1950) 18, 21 (nomen et descriptio pollinis). —*G. uliginosum* L. Sp. pl. (1753) 856 p. p. —*G. uliginosum* β. *lasiocarpum* Ldb. fl. Ross. II, 2 (1845–1846) 609 p. p.—*G. uliginosum* auct. mult. fl. Extr. Orient, non L.: Kom. in Tr. Peterb. Bot. Sada XXV (1907) 615, p. p.; Kom. and Alisova, Opredel. Rast. Dalnevost. Kr. II (1932) 1023, p. p.; Kitagawa in Rep. Inst. Sc. Res. Manch. 111, App. 1 (1939) 451 p. p.: Sugawara, Ill. fl. Sagh. IV (1940) 1785.

Annual. Plant not producing prostrate forms and provided with flocculose, white-tomentose pubescence, more strongly expressed above; stem erect or ascending (15)25–35(45) cm high, at base (1.5)2–3(4) mm
385 thick, more or less woody, with slender, upright branches; often stem branched in a more complex way, producing much longer branches often almost as long as the main stem from which arise short lateral shoots. Leaves oblong-linear, 2.0–3.5 (sometimes up to 7.0) cm long and (1.5)2.0–2.5(4.0) mm wide, usually narrowed from middle into petiole; lower cauline leaves withering rather early, usually persisting

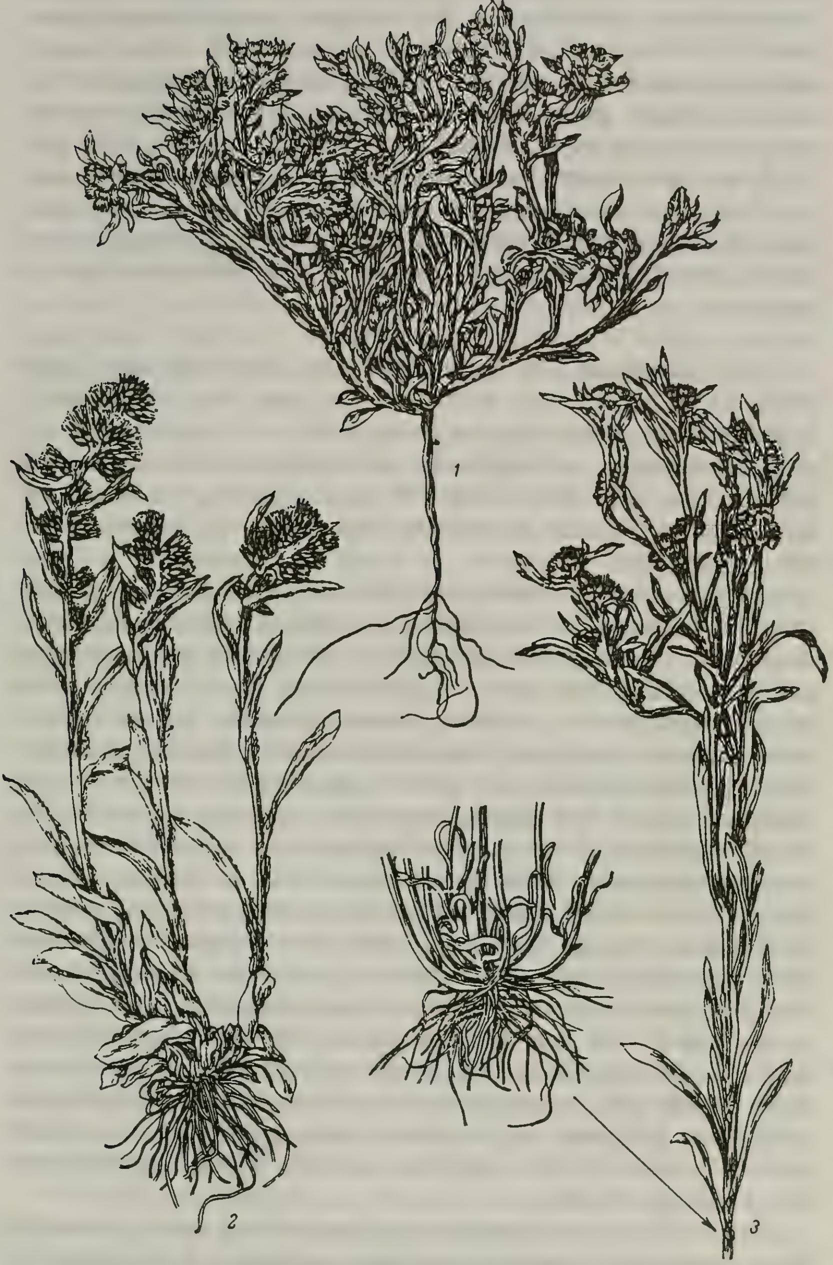
on stem; bracteal leaves usually not different from cauline leaves, often more strongly pubescent than latter, closely surrounding inflorescence and two or more times as long as inflorescence. Compound inflorescence of indefinite number (often 5 to 15) of cupulate capitula, 4.5–5.0 mm wide and 3.5 mm long, on short arachnoid-lanate, 2.0–2.5 mm long peduncle. Involucre two- or three-rowed; outer involucral bracts ovate, often at base tomentose, brownish-yellow; inner bracts oblong, acuminate, smooth, usually yellowish or straw-golden, very slightly longer than inflorescence. Receptacle favoid, with regular locules. Bisexual florets about seven; corolla tube yellowish, almost cylindrical, slightly broadened toward apex and terminating in five triangular, brownish lobes. Pistillate florets filiform, 125–135, slightly broader below and with prominent glands in upper part. Achenes about 0.75 mm long, ovoid-fusiform, with long papillose base, entirely papillose; pappus of 8–10 fine, separately falling, closely toothed hairs. Flowering VII–X. (Plate XXIV, Fig. 3).

Meadows, around dwellings, fallow fields, riverbanks and reservoirs, various types of wet soils. —*Far East:* Zeya-Bureya, Uda River area, Ussuri, Sakhalin. *General distribution:* Japan (rarely) and China (Manchurian floristic province), Korea. Described from the Pacific Coastal Territory. Type in Leningrad.

Note. Relatively detailed information on geography, ecology and variation is given in the original descriptions of *G. tranzschelii* Kirp. and also the following five species.

2. **G. mandshuricum** Kirp. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XX; Kirp. and Kupr. in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, 9 (1950) 18, 21 (nomen et descriptio pollinis). —*G. uliginosum* L. Sp. pl. (1753) 856 p. p. —*G. ulginosum* β. *lasiocarpum* Ldb. Fl. Ross. II, 2 (1845–1846) 609, p. p. —*G. uliginosum* auct. mult. fl. Extr. Orient., non L.: Kom. in Tr. Peterb. Bot. Sada XXV (1907) 615, p. p.; Kitagawa in Rep. Inst. Sc. Res. Manch. III, App. 1 (1939) 451 p. p.

Annual. Stem (5)12–18(25) cm high, more or less erect, usually producing slender, upright shoots from base; plant grayish-green or greenish, glabrous or slightly flocculose in lower half, with distinct white-flocculose-tomentum in upper half. Leaves 1.5–2.0 cm long and 2–3 mm wide, linear-lanceolate, petiolate, acute or subobtuse; bracteal leaves usually not distinguishable from cauline. Inflorescence
386 glomerate, of a few capitula; sometimes capitula in lax spike or solitary; capitula usually cupulate, 3.5–4.0 mm wide and about 2.5–3.0 mm long, on slender arachnoid-lanate, about 5 mm long peduncle. Involucre two- or three- of golden-brown bracts; outer bracts dorsally pubescent, oval-ovate, inner oval-lanceolate, acute. Receptacle glabrous, alveolate.



387

Plate XXIV.

1—*Gnaphalium rossicum* Kirp.; 2—*G. caucasicum* Somm. and Lev.; 3—*G. tranzschelii* Kirp.

Bisexual florets five or six; corolla tube yellowish-brownish, narrow infundibuliform, terminating in five triangular lobes. Pistillate florets about 75, filiform, yellowish, glandular in upper part. Achene usually papillose, about 0.5–0.7 mm long, ovoid-rectangular, with more or less prominent edges; pappus of seven or eight slender, closely toothed bristles. Flowering VI–IX (X?).

River banks, mostly in flooded plains. —*Far East:* Zeya-Bureya, Uda River area, Ussuri (along the Amur River and also, but less often, along the Ussuri River). *General distribution:* China (Sungari River valley). Described from Radde's collections from Manchuria. Type in Leningrad.

3. **G. baicalense** Kirp. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XX; Kirp. and Kupr. in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, 9 (1950) 18, 21 (nomen et descriptio pollinis). —*G. uliginosum* L. Sp. pl. (1753) 856 p. p. —*G. uliginosum α. leiocarpum* and β. *lasiocarpum* Ldb. Fl. Ross. II, 2 (1845–1846) 609, p. p. —*G. uliginosum* auct. fl. baic.-dah., non L.: Turcz. in Bull. Soc. Nat. Mosc. XX, 3 (1847) 4 (Fl.
389 baic.-dah. No. 630).

Annual or biennial. Stem(7) 12–15(20) cm high, erect or (sometimes) spreading-branched, with spreading or white-flocculose pubescence in upper half, in lower half (particularly at base) more or less glabrous and often reddish, near root collar 1.0–2.5 mm thick. Leaves 2.5–4.0 cm long and about 3 mm wide, linear-lanceolate, petiolate, more or less green or greenish-red, somewhat pubescent (often insignificantly). Inflorescence glomerate, of which upper glomerules usually of numerous capitula and slightly larger than others on lateral shoots; capitula cupulate, 4–5 mm wide and 3–4 mm long, on 1.5–2.0 mm long arachnoid-tomentose peduncle. Involucre two- or three-rowed, of brownish bracts; outer bracts ovate, dorsally tomentose-lanate, half to two-thirds as long as oblong-oval inner bracts, slightly longer than florets. Receptacle more or less uniformly alveolate. Bisexual florets about five; corolla tube yellow-brownish, almost cylindrical, slightly wider in upper part, with five triangular lobes. Pistillate florets filiform,
389 about 125, yellowish-brown, often with broad, violet limb, with prominent glands in upper part. Achenes more or less 0.5 mm long, ovoid-cylindrical or fusiform, with more or less distinct edges, glabrous or (less often) papillose; pappus of five to eight fine, separately falling, closely toothed hairs. Flowering VII–VIII.

Banks of rivers and streams, edges of marshes and on hillocks, sandy places; sometimes in meadows and saline marshes. —*Eastern Siberia*: Angara-Sayans, Dauria. *General distribution*: Mongolia, China (northeastern part). Described from Trans-Baikal (region of Yeravinsk Lakes). Type in Leningrad.

4. **G. rossicum** Kirp. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR XIX (1959) 349; Grossh. Opredel. Rast. Kavk. (1949) 444 (descr. ross.); Kirp. and Kupr. in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, 9 (1950) 18, 21 (nomen et descriptio pollinis); A. Shkhiyan in Fl. Gruzii VIII, 263 (descr. georgica); Majevski, Flora, Izd. 8, 569 (descr. ross.). —*G. uliginosum* L. Sp. pl. (1753) 856, p. p.; Ldb. Fl. Ross. II, 2, 609. p. p.; Schmalh. Fl. II, 46, p. p.; Fedtsch. and Fler. Fl. Evrop. Ross. 958, p. p. —*G. uliginosum* L. 1. *erectum*, 2. *ramosissimum* and 3. *prostratum* Gruner in Bull. Soc. Nat. Mosc. XLI, 2 (1868) 421. —*G. uliginosum* L. a. *stricta*, b. *pumila*, c. *ramosa* and d. *intermedia* Sukacz. in Tr. Obshch. Ispyt. Prir. Khar'k. Univ. XXXVII (1903) 352.

Annual. Stem (5)10–20(25) cm high, spreading-branched from base or erect, entirely covered by thick, white tomentum, especially dense in upper part below inflorescence at base 2–4 mm thick, more or less woody. Leaves 2–5 cm long and 3–6 mm wide, oblong-linear or oblong-spatulate, with abruptly elongated tip, tapering to base, greenish, on both sides, more or less pubescent; bracteal leaves smaller than cauline ones, enclosing and considerably longer than inflorescence. Inflorescence glomerate, comprising 7–10 capitula, some usually underdeveloped; capitula (normal) cupuliform, 4–6 mm wide and about 3 mm long, on densely arachnoid-tomentose peduncle, more or less as long as capitulum. Involucre two- or three-rowed; outer bracts ovate or ovate-oval, basally tomentose-lanate, half as long as inner, oblong, acute, yellowish bracts, one-fourth to one-third longer than florets. Receptacle with rhomboidal locules. Bisexual florets 8–10; corolla tube dull yellowish or brown, at base truncate-conical, more or less cylindrical in upper part, slightly widened upward and terminating in five triangular lobes. Pistillate florets about 150 with filiform, almost cylindrical, corolla, slightly widened below, with prominent glands in upper part. Achenes about 0.5 mm long, oval-cylindrical, or fusiform; usually covered with upward-pointed papillae, more or less half of fruit width;
391 achenes of bisexual florets distinctly angular (not as distinctly as achenes of pistillate florets) and papillose at base; pappus of a few (five to eight) fine, separately falling, closely toothed hairs. Flowering (VI)VII–X. (Plate XXIV, Fig. 1).

Coastal sands, sandy shoals and other young alluvial deposits, sometimes along roads, in fields and fallow lands, on dry stream beds, etc. As a whole, *G. rossicum* is a species characteristic of the forest-steppe and steppe regions of the European part of western Siberia. —*European Part*: Middle Dnieper, Volga-Don, Trans-Volga, Bessarabia, Black Sea

Region, Lower Don, Lower Volga; *Caucasus*: (introduced?, rarely, except Talysh); *Western Siberia*: Upper Tobol, Irtysh, Altai (westernmost); *Eastern Siberia*: Angara-Sayans (extreme western part); *Soviet Central Asia*: Aralo-Caspian, Balkhash (rarely). No reliable collections from outside the USSR. Described from Saratov Province. Type in Leningrad.

Note. G. rossicum hybridizes with *G. sibiricum* and *G. uliginosum* s. str.

5. **G. sibiricum** Kirp. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR XX; Kirp. and Kupr. in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, 9 (1950) 18, 21 (nomen et descriptio pollinis); Karavaev, Konsp. Fl. Yakutii (1958) 168. —*G. uliginosum* L. Sp. pl. (1753) 856, p. p. —*G. uliginosum* α. *leiocarpum* and β. *lasiocarpum* Ldb. Fl. Ross. II, 2 (1845–1846) 609, p. p. —*G. uliginosum* auct. fl. Sibr., non L.; Krylov, Fl. Zap. Sib. XI (1949) 2701.

Annual. Stem (4)12–15(20) cm high, slender, usually branched from base, white-tomentose only above, weakly pubescent below, but usually glabrous near base. Leaves oblong-linear or linear-lanceolate, 1.5–3.0 cm long and 2–3 mm wide, acute or acuminate, greenish, not densely pubescent; bracteal leaves considerably longer than inflorescence. Inflorescence glomerate, of indefinite number of capitula; terminal glomerules of more or less 8–10 and lateral of a few capitula or (rarely) capitula solitary; capitula cupuliform, 3–4 mm wide and 2–3 mm long, on arachnoid-lanate, about 2 mm long peduncle. Involucre three-rowed; outer bracts ovate, inner ones lanceolate, obtuse or acute, yellowish-brown, very slightly longer than florets. Receptacle uniformly alveolate. Bisexual florets usually six; corolla tube yellowish-brown, almost cylindrical, terminating in five brown, triangular lobes. Pistillate florets about 80, filiform, almost transparent, in uppermost part brown and glandular. Achenes about 0.5 mm long, rectangular-cylindrical with distinct edges, and quite long papillose base, almost always covered with papillae; pappus of a few (six to eight), fine, closely toothed, fragile, separately falling hairs. Flowering (VI) VII–IX.

Sandy riverbanks, in wet places, meadows, roadside. —*European* 391 *Part*: Karelia-Lapland, Volga-Kama; *Western Siberia*: Ob Region, Upper Tobol (northern part), Irtysh; *Eastern Siberia*: Yenisei, Lena-Kolyma, Angara-Sayans. Described from Tyumen. Type in Leningrad.

Note. Apparently, *G. sibiricum* hybridizes with *G. uliginosum* L. s. str. and *G. rossicum* Kirp.

6. **G. kasachstanicum** Kirp. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XX; Kir. and Kupr. in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, 9 (1950) 18, 21 (nomen et descriptio pollinis). —*G. uliginosum*

L. Sp. pl. (1753) 856, p. p. —*G. uliginosum* β. *lasiocarpum* Ldb. Fl. Ross. II, 2 (1845–1846) 609, p. p. —*G. uliginosum* auct. fl. Kasachst., non L.; O. and B. Fedtsch. Perech. Rast. Turk. IV (1911) 209, p. p.; Pavl. Fl. Tsentr. Kazakhst. III (1938) 230, p. p.

Annual. Stem (7)10–15(20) cm high, erect, about 1 mm thick, not profusely branched or branching from base, with upright shoots; entire plant grayish-green or grayish-white from sparse tomentum on stem and leaves. Leaves covering entire stem, 1.5–3.0 cm long and about 3 mm wide, oblong-linear, acuminate or cuspidate, tapering to base, sometimes more or less asymmetrical and curved; bracteal leaves like cauline but smaller, enclosing and usually slightly longer than inflorescence; lower leaves not falling on withering and usually forming a unique rosette near root collar with undeveloped shoots. Inflorescence glomerate, of three to six capitula; capitula (some often undeveloped) deltoid-cupuliform, 4–6 mm wide and 2–3 mm long, on slender, arachnoid-tomentose, 2–3 mm long peduncle. Involucre two- or three-rowed; outer bracts ovate-oval, at base tomentose-lanate, two-thirds as long as oblong, more or less acute, straw-yellow inner bracts, one-third to one-fourth longer than florets. Receptacle glabrous, alveolate. Bisexual florets about eight, yellowish, gently conical, above with five broad, triangular limbs. Pistillate florets about 75, with filiform corolla slightly broadened below, with prominent glands in upper part. Achenes about 0.5 mm long, ovoid-cylindrical or fusiform, somewhat distinctly angular, papillose; pappus of five to eight fine, separately falling, closely toothed hairs. Flowering VI–VII (VIII).

On relatively saline soils; wormwood-chenopod steppes, on alkali soils and alkaline meadows, in steppe depressions, in the Altai-Dzhungarian Region in low-montane steppe-forming areas. —*European Part*: ?Lower Volga; *Western Siberia*: Upper Tobol (southwest), Irtysh (southeast), Altai (southwest); *Eastern Siberia*: ?Angara-Sayans (western part of Tuva Autonomous Region); *Soviet Central Asia*: Aralo-Caspian, Balkhash Region, Dzhungaria-Tarbagatai. *General distribution*: ?Mongolia. Described from Akmolinsk Province. Type in Leningrad.

7. **G. uliginosum** L. Sp. pl. (1753) 1856, p. p.; Ldb. Fl. Ross. II, 2 (1845–1846) 609, p. p.; Schmalh. Fl. II, 46, p. p.; Syr. Ill. Fl. Mosc. 392 Gub. III, 247; Fedtsch. and Fler. Fl. Evrop. Ross., 958, p. p.; Kom. Fl. Kamch. III, 133, p. p.; Sorn. Rast. SSSR, IV, 207, p. p.; Perf. Fl. Sev. Kraya, II–III, 347; Majevski, Flora. Izd. 8 (1954) 569; Briq. and Cav. in Burnat. Fl. d. Alpes Marit. VI, 2 (1917) 269. —*G. aquaticum* Mill. Dict. ed. VIII (1768) No. 5. —*G. castaneum* Gilib. Fl. Lithuan. III (1781) 179 (n. v.). —*G. nudum* Hoffm. Deutschl. Fl., ed. 1 (1791) 292. —*G. tomentosum* Hoffm. ibid. —*G. ramosum* Lam. Fl. Franc. II (1795)

65.—*G. pilulare* Wahlenb. Fl. Lap. (1812) 205, tab. 13; DC. Prodr. VI (1837) 231. —*G. pilulare* β. *nudum* DC., ibid. —*G. tomentosum* Luce, Topogr. nachr. Ins. Oesel (1823) 275. —*G. uliginosum* β. *pilulare* Koch. Synops., ed. 2, 1 (1843) 400. —*G. uliginosum* γ. *glabrum* Koch. ibid. —*G. uliginosum* α. *leiocarpum* and β. *lasiocarpum* Ldb. Fl. Ross. II, 2 (1845–1846) 609, p. p. —*G. uliginosum* α. *incanum* and β. *viride* Neilr. Fl. Nied.-Oesterr. (1859) 356. —*G. uliginosum* α. *lasiocarpum* Schur. Enum. pl. Transs. (1866) 318. —*G. laevissimum* Schur. ibid. —*G. uliginosum* α. *pseudo-pilulare* Abrom. ex Scholz in Schr. Phys.-Oek. Ges. Koenigsb. XXXVI (1895) 19; Syreistch. ibid.; Fedtsch. and Fler. ibid. —*Elichrysum uliginosum* Moench, Meth. (1794) 576.—*Filaginella nuda* Opiz. Seznam (1852) 44. —*F. uliginosa* Opiz. ibid.—*Helichrysum aquaticum* Rupr. Fl. Ingr. (1860) 575. —**Ic.**: Syreistsch. op. cit., str. 247; Bonnier, Fl. Compl. Ill. France, Suisse and Belg. VI (1923), tab. 307, fig. 1528 (color., mediocr.); Javorka and Czapody, Iconogr. Fl. Hungar. (1933), tab. 512, fig. 3668; Dostal, Klič (1954), fig. 2305. —**Exs.**: GRF No. 1116; Annenkov, Fl. Mosq. exs. (sine numero); Poganko, Orl. Flora (sine numero); Herb. Fl. Ingr. No. 324; Billot, Fl. Gall. et Germ. exs. No. 3123 (sub nom. *G. pilulare* Wahlenb.); Billot et al., Fl. exs. No. 3869 (sub nom. *G. pilulare* Wahlenb. β. *humifusum* Paill.); Callier, Fl. siles, exs. No. 616 (sub nom. *G. uliginosum* var. *pilulare* Wahlenb.); F. Schultz. Herb. norm. cent. 6°, No. 501 (sub nom. *G. pilulare* Wahlenb.); Rchb. Fl. Germ. exs. No. 1429 (sub nom. *G. nudum* Hoffm.); Billot, Fl. Gall. and Germ. exs. nos. 42bis; Eesti Taimed No. 24; Fl. exs. Austro-Hung. No. 1789; Fl. exs. Rhen, No. 29; Hayek, Fl. Stir. exs. No. 395; Petrak, Fl. Bohem. et Morav. exs. No. 690; Pl. Finl. exs. No. 382a, b; Pl. Polon. exs. No. 164a, b.

Annual. Stem (11)12–15(30) cm high, spreading branched from base or (sometimes) more or less erect, (1.0)1.5–2.0 mm thick; entire plant gray, grayish-green or whitish from usually spreading or flocculose-tomentose pubescence, particularly so in upper part below inflorescence; less often plant subglabrous or glabrous. Leaves (1)2–5 cm long and 1.5–3.0(5.0) mm wide, linear-lanceolate, petiolate, often more or less falcate; bracteal leaves like cauline ones, smaller but longer than inflorescence. Inflorescence glomerate, of 3–10 bowl-shaped capitula, about 5 mm wide and 3 mm long, on arachnoid-tomentose peduncles; only sometimes capitula solitary. Involucre two- or three-rowed, of brownish bracts; outer bracts ovate and considerably shorter
393 than broadly lanceolate inner bracts. Receptacle glabrous, alveolate. Bisexual florets about 8–10; corolla tube yellowish, with triangular brown lobes at tip. Pistillate florets filiform, about 75, almost transparent or yellowish, brown in uppermost part, with prominent glands. Achenes about 0.5 mm long, ovoid- or rectangular-cylindrical, distinctly angular,

glabrous or papillose; pappus of about 10 fine, separately falling, closely toothed hairs. Flowering VI–X.

Banks of rivers, lakes and ditches, roadsides, on various types of wet depressions on mucky, peaty and moist soils of differing mechanical composition, sometimes on rocky places (Karelia-Lapland Region). A weed, generally on fallow lands and wastelands. —*European Part*: Karelia-Lapland, Dvina-Pechora, Baltic Region, Ladoga-Ilmen, Upper Volga, Volga-Kama, Upper Dnieper, Middle Dnieper, Volga-Don, Upper Dniester; *Far East*: Kamchatka. *General distribution*: Western Europe (except the Arctic), Greenland and North America (introduced?). Described from western Europe. Type in London.

Note. The above-cited (but far from being comprehensive!) synonymy clearly shows that taxonomists have tried in every way to reflect the extraordinary variability of *G. uliginosum* L. s. str. in names. From our point of view, this is an exercise in futility, because there is no need to designate by separate names the extremely numerous modifications of the marsh cudweed. This plant is related to the group of species that are unusually sensitive in responding to even minor, sometimes hardly detectable, changes of habitat conditions. Often individual plants within a small, superficially homogeneous area distinctly differ in habit from each other. Thus, for example, on the outskirts of the peat marsh near Kobrino (Gatchinskii Region of Leningrad Province) on the same day and within an area of 1 m^2 plants were collected that were unbranched and branched from the base, prostrate-spreading and erect, large and small, strongly pubescent and weakly pubescent, etc. Even the character of the pubescence of the achenes, which is quite constant in many Compositae, did not hold up at all in *G. uliginosum* s. str. Syreistschikov (1931) cites an instance when within the same specimen the achenes in the terminal capitula had papillate hairs but the achenes in the capitula on the lower branches were glabrous. The polymorphism of *G. uliginosum* L. s. str. complicates the taxonomy of this species. The situation is made the more complicated by the ability of the marsh cudweed to hybridize easily with the closely related species *G. rossicum* Kirp. and *G. sibiricum* Kirp. to produce intermediate connecting forms, which are difficult to identify. The most typical variety (formae "*genuinum,*" "*typicum,*" etc.) of *G. uliginosum* L. s. str. is represented by the specimens that are gray-pubescent (forma "*tomentosum*"), 12–15 cm high, mostly branched (forma "*ramosum*"), with glabrous achenes; sometimes in similar plants the pubescence more or less disappears; sometimes the achenes are covered with papillose hairs. Dwarf plants, often scarcely rising above the ground and, as a rule, weakly pubescent with papillose achenes, are character-
394 istic of the plants growing on the acidic soils and among the rocks of Lapland (forma "*pilulare*"). In places inundated for a more or less long

time, *G. uliginosum* L. s. str. grows as a small plant often more or less completely devoid of pubescence (formae "*nudum*," "*glabrum*," etc.). The hybrid forms with *G. rossicum* Kirp. and *G. sibiricum* Kirp. differ from the typical ones by the more dense, whitish pubescence, the type and nature of the pubescence of the leaves, as well as by other characters; the achenes are sometimes glabrous, sometimes papillose.

Cudweeds of the *G. uliginosum* L. s. l. complex growing in Kamchatka do not conform fully to any of the species known to us, but at the same time they do not represent a separate natural race. First of all, we come across specimens quite reminiscent of European *G. uliginosum* L. s. str. Besides, among the Kamchatka cudweeds we find specimens closer to *G. tranzschelii* but also forms standing closer to *G. sibiricum* or *G. baicalense*. The common characters of cudweeds from Kamchatka are the absence of papillose on the achenes and often stunted growth. It is quite possible that the marsh cudweed is not found in Kamchatka naturally in general, and that all specimens from there represent introduced forms that are more or less successfully acclimatizing and producing a number of local hybrids.

Economic Importance: Species from the *G. uliginosum* L. s. l. complex have long been used in folk medicine and at the present time are being adapted to formal medicine as well. Preparations from the marsh cudweed are being prescribed for the treatment of the initial stages of a neurological form of hypertension, but the medicinal properties of the plant are most effectively manifest in the treatment of old neglected wounds, fistulas and ulcers (including ulcers of the stomach and duodenum), as well as in several other cases.

It is evident that not all of the above-enumerated species possess the same contents of active medicinal ingredients. In this conection, it is necessary to conduct more detailed investigations on the true taxonomic circumscription of the *G. uliginosum* L. s. l. complex.

Species of cudweed are definitely important as weeds, harmful to garden and field crops.

Section 2. Calolepis Kirp. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR XX. —Sect. *Eugnaphalium* DC. Prodr. VI (1837) 222, p. min. p. —Involucral bracts scaly, lustrous, usually bright yellow or golden.

Type of section: *Gnaphalium luteo-album* L.

Note. Of the species found in the USSR, we refer the introduced *G. affine* D. Don to section *Calolepis*. However, it must be said that the position of this species in the genus *Gnaphalium* (as also that of *G. luteo-album*) is extremely doubtful. A whole series of data speaks in favor of the need to transfer *G. luteo-album* to the genus *Helichrysum;* and, as far as *G. affine* D. Don is concerned, this species is closest to

395 members of the genus *Lepicline* Cass. As the question of the position in the *Gnaphalium* alliance of both of these species can only be more precisely resolved after further investigation, we, relying on the formal characters (the ratio of the bisexual and pistillate florets in the capitulum), retain them for the time being in the genus *Gnaphalium*.

8. **G. luteo-album** L. Sp. pl. (1753) 851; Ldb. Fl. Ross. II, 2, 608; Schmalh. Fl. II, 46; O. and B. Fedtsch. Perech. Rast. Turk. IV, 208; Hegi, Ill. Fl. VI, 1 (1917) 467; Grossh. Fl. Kavk. IV (1934) 102 and Opredel. Rast. Kavk., 444. —*G. conglobatum* Lam. Fl. Fr. II (1778) 64. —*Elichrysum conglomeratum* Moench, Meth. (1794) 576. —*Helichrysum luteo-album* Rchb. in Moessler, Handb., ed. 2, II (1829) 1460. —*Filaginella luteo-alba* Opiz, Seznam (1852) 44. —**Ic.**: Bonnier, Fl. Compl. Ill. France, Suisse et Belg., VI (1923), tab. 308, fig. 1536 (color., mediocr.); Javorka and Czapody, Iconogr. Fl. Hungar. (1934), tab. 513, fig. 3669 (bona); Dostal, Klič (1954), fig. 2304. —**Exs.**: GRF No. 1023; Woronow, Pl. Abchaz. exs. (sine numero); Billot, Fl. Gall, et Germ. exs. No. 43; Fl. exs. Austro-Hung. No. 1793; Fl. exs. reip Bohem. Slov. No. 929; Kickxia Belgica, cent. III, 1867, No. 263; Pl. Polon. exs. No. 163; Rchb. Exs. No. 829; Rehm. and Woloszcz. Fl. Polon. exs. No. 355.

Annual. Root slender, fusiform, producing one to several stems; sometimes numerous ascending stems arise from root. Plant (3)10–35(70) cm high, entirely covered with lanate or arachnoid-tomentose, whitish pubescence; stems usually simple, less often branched, more or less densely leafy. Lower leaves oblong-spatulate or oblong-obovate, obtuse; middle and upper leaves oblong to linear, acute and semiamplexicaul. Capitula on densely tomentose, arachnoid-hairy peduncles, aggregated in compact corymbose-capitate compound inflorescence (glomerules), terminal on stem and branches. Involucre longer than inflorescence; involucral bracts thin-membranous, straw-yellow to whitish, lustrous, almost uniform in size, usually stellately spreading after fruiting; outer bracts ovate or oblong, dorsally more or less tomentose; inner bracts broad linear, broadened in upper part. Corolla of florets reddish at apex, glandular. Pappus hairs very fine, somewhat toothed, connate at base (by processes of hair cells) and falling in groups or separately; achenes brown, 0.5–0.75 mm long, covered with very short, light-colored hairs. Flowering VI–IX.

Damp, mainly sandy soils, dry riverbeds, banks of rivers and irrigation canals, in thinned and cut over forests, sometimes a weed in vegetable gardens and fields. —*European Part*: ?Dvina-Pechora (a single locality needing confirmation), Baltic Region, Upper Dnieper, Middle Dnieper, ?Upper Dniester, Black Sea Region, Lower Don? Lower Volga; *Caucasus*: Ciscaucasia, western and eastern Transcaucasia, Dagestan, Talysh; *Soviet Central Asia*: Aralo-Caspian, mountainous Turkmenia, 396 Pamiro-Alai. *General distribution*: Central Europe, Atlantic Europe, Mediterranean, Balkans-Asia Minor, Armenia and Kurdistan, Iran? Dzhungaria-Kashgaria? China, America and Australia. Described from western Europe. Type in London.

Note. In most published sources *G. luteo-album* L. is treated among the so-called cosmopolitans ("worldwide, except the Arctic"—as usually defined). However, as a matter of fact, this is not altogether so, and the question of the distribution of *G. luteo-album* needs more detailed study. This species is not reported from America in the new edition of Britton and Brown, not mentioned for Japan by Kitamura, and in most of the countries of southern Asia it is replaced by the closely related species *G. affine* D. Don. In Europe, *G. luteo-album* is distributed very unevenly, and the usual area of its not entirely regular range is linked as a whole, apparently, with the biology of this species as a weedy plant. Nevertheless, *G. luteo-album* L. s. l., sporadically found in all parts of the world, represents a complex, polytypic species, from which repeatedly already numerous taxa of different ranks have been split off (not, having importance, however, within the territory of the USSR).

Economic Importance. During flowering it contains a considerable quantity of tanning substances.

***G. affine** D. Don, Prodr. Fl. Nep. (1825) 173; Ohwi, Flora of Japan (1953) 1134. —*G. multiceps* Wall. ex DC. Prodr. VI (1837) 222; Palib. in Tr. Peterb. Bot. Sada XVII (1898) Ill; Hand.-Mazz. Symb. Sin. 4 (1936) 1106; Kitam. in Mem. Coll. Sc. Kyoto Univ., ser. B, XIII (1937) 216. —*G. confusum* DC. l. c.; Grossh. Fl. Kavk. IV (1934) 101 and Opredel. Rast. Kavk., 444; Kolak. Fl. Abkhaz. IV, 209; A. Shkhiyan in Fl. Gruzii VIII (1952) 264. —*G. luteo-album* var. *multiceps* (Wall. ex DC.) Hook. fil. Fl. Brit. Ind. III (1881) 288. —*G. luteo-album* ssp. *affine* Koster in Blumea IV (1941) 484. —**Exs.**: Schindler, Pl. sinensis No. 284.

Annual. Rhizome slender, producing one or sometimes few simple or branched stems (10)15–40(50) cm high. Leaves as well as stem white- or grayish-tomentose, oblong-obovate or oblong-spatulate; upper leaves usually with well-developed cusp, tapering to base; lower leaves mostly broader and larger than upper ones, more or less long-petiolate. Capitula globose-campanulate, in all 2–3 mm wide, numerous, in compact, capitate, solitary or clustered corymbs at apices of stem or branches. Involucral bracts three-rowed, thin, membranous, bright lemon-yellow or golden, lustrous, oblong; outer bracts somewhat shorter than inner. Pappus hairs yellowish, fine, somewhat toothed, slightly connate at base; achenes red-brown, about 0.5 mm long, covered with a large number of hyaline hairs often exceeding width of achene. Flowering (?IV)V–VIII (IX).

Gravel beds, edges of paddies, banks of irrigation canals and ditches. —*Caucasus*: Western Transcaucasia (rarely). Introduced (from India?). 397 *General distribution*: India and Himalayas, Dzhungaria-Kashgaria, Japan-China, Tibet. Described from Nepal. Type in London.

Note. G. affine D. Don is close to *G. luteo-album* L., from which it is easily distinguished by its smaller and also bright lemon-yellow or golden capitula; consequently, *G. affine* is quite similar in habit to members of the genus *Helichrysum.*

Subgenus II. **Synchaeta** Kirp. in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, 9 (1950) 33 (pro gen.). —*Gamochaeta* Wedd. Chlor. And. I (1855) 151, p. min. p. —*Omalotheca* subgen. *Gamochaetiopsis* Schultz. fr. Arch. de Flore (1861) 311. —*Gnaphalium* L. subgen. *Gamochaeta* Gren. Fl. Ch. Jurass. (1869) 427. —*Gnaphalium* L. sect. *Gamochaeta* (Wedd.) Hoffm. in Nat. Pflanzenfam. IV, 5 (1894) 188, p. min. p. —Capitula in compact or more or less lax spicate inflorescence; pappus of hairs or bristles connate into ring at base; pollen grains 18–23.5 μm in diameter, with broad furrows, round pores and slender, attenuate-acuminate, often sessile, conical spines. Perennial, more or less tall plants, which often are found in the montane forest, subalpine and alpine zones, as well as in the forest zone in the lowlands.

Type of subgenus: *Gnaphalium sylvaticum* L.

9. **G. sylvaticum** L. Sp. pl. (1753) 856; Ldb. Fl. Ross. II, 2, 610; Turcz. in Bull. Soc. Nat. Mosc. XX, 3 (1847) 5 (Fl. baic.-dah., No. 631); Schmalh. Fl. II, 46; O. and B. Fedtsch. Perech. Rast. Turk. IV, 209; Br.-Bl. in Vierteljahr. Naturf. Ges. Zürich LXII (1917) 614; Briq. and Cav. in Burnat. Fl. d. Alpes Marit. VI, 2 (1917) 279; Hegi Ill. Fl. VI, 1, 463; Grossh. Fl. Kavk. IV (1934) 102 and Opredel. Rast. Kavk., 444; Pavl. Fl. Tsentr. Kazakhst. III, 230; Krylov, Fl. Zap. Sib. XI, 2699; —*G. spadiceum* Gilib. Fl. Lithuan. III (1781) 180. —*G. rectum* Sm. Engl. Bot. II (1793), tab. 124. —*G. silvaticum* β. *macrostachys* Ldb. Fl. alt. IV (1833) 57; Kar. and Kir. in Bull. Soc. Nat. Mosc. XIII, 3 (1841) 443. —*G. sylvaticum* α. *rectum* DC. Prodr. VI (1837) 232. —*G. sylvaticum* f. *virgatum* Kitt. in Taschenb. Deutschl. Fl. ed. II (1844) 602; Syreistsch. Ill. Fl. Mosk. Gub. III, 247; Govorukhin, Fl. Urala, 488. —*G. sylvaticum* β. *macrostachyum* Ldb. op. cit. (1845–1846) 610; Kyrlov, Fl. Alt. III, 601. —*G. racemosum* Boguslav in Lesn. Zhurn. Vol'n.-e'kon. obshch. No. 1 (1846) 22 and in Erman's Archiv, f. wiss. Kunde VI (1846) 61; Trautvetter in Tr. Peterb. Bot. Sada VIII, 2 (1883) 467. —*G. sylvaticum* α. *montanum* Neilr. Fl. Nied.-Oesterr. (1859) 358. —*G. sylvaticum* β. *abbreviatum* Kauffm. Mosk. Flora (1866) 250; Syreistsch. op. cit.; Govorukhin, op. cit. —*G. sylvaticum* β. *stramenticum* Beck. Fl. Nied.-

Oesterr. II, 2 (1893) 1178; Syreistsch. op. cit. —*G. norvegicum* auct. nonn., non Gunn.; Sugawara, Ill. Fl. Sagh. IV (1940) 1787. —*Elichrysum strictum* Moench. Meth. (1794) 576. —*Cyttarium silvaticum* Peterm. Fl. Lips. exc. (1838) 609 (incl. β. *ramosum* Peterm.). —*Gamochaeta silvatica* 398 (L.) Wedd. Chlor. And. I (1855) 151.—*Omalotheca sylvatica* Schultz. fr. Arch. de Flore (1861) 311. —*O. einseleana* Schultz. fr. ibid. —*Synchaeta silvatica* (L.) Kirp. in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, 9 (1950) 33. —**Ic.**: Syreistsch. Ill. Fl. Mosk. Gub. III (1910), Str. 247; H.G. Reichenb. Icon. Fl. Germ. et. Helv. XVI (1853) 949, fig. 1 (color.); Hegi, op. cit. tab. 261, fig. 6 (ic. mediocr.); Bonnier. Fl. Compl. Ill. France, Suisse et Belg. VI (1923), tab. 307, fig. 1526 (color.); Lindman, Bild. Nord. Fl., ed. 2/3, III (1926), tab. 527, fig. 1–4 (color., opt.); Javorka and Czapody, Iconogr. Fl. Hungar. (1933), tab. 513, fig. 3672 (bona); Dostal, Klič (1954), fig. 2300. —**Exs.**: GRF No. 821; Annenkov, Fl. Mosq. exs. No. 29; Pabo and Cholovskii, Gerb. Mogilevsk. Gub. (sine numero); Paganko, Orl. Flora (sine numero); Herb. F. Ingr. Nos. 325, 325b; Kar and Kir. No. 817; Callier, Fl. Siles. exs. No. 615; Eesti Taimed No. 23; Fl. exs. Austro-Hung. No. 1790; Fl. exs. Bohem.-Slov. Nos. 927, 928; Hayek, Fl. Stir. exs. No. 1073; Petrak, Fl. Bohem. et Morav. exs. No. 1091; Pl. Finl. exs. No. 381; Pl. Polon. exs. No. 165; Rehm. and Wolosz. Fl. Polon. exs. Nos. 184a, 184b.

Perennial. Rhizome short, usually with blackish-brown remains of leaves of previous years. Stems (10)20–60(80) cm high, usually solitary or few, erect or ascending, simple (with rarest of exceptions), whitish- or gray-tomentose or weakly floccose-lanate. Leaves linear or linear-lanceolate, acute, green or (less often) grayish-green, subglabrous or more or less appressed hairy above; cauline leaves semiamplexicaul, gradually reduced upward; lower leaves relatively broader, more or less long-petiolate. Capitula cylindrical or campanulate (sometimes narrowed at tip and then turbinate), usually 5–7 mm long and 3–5 mm wide, in axils of leaves and terminal in more or less compact, but usually lax or remote, compound spikes, often nearly half (sometimes even more) as long as entire stem; in fully grown plants, bracteal leaves in uppermost part of spike inconspicuous; if conspicuous, then not longer than inflorescence (with exception of undeveloped plants, in which bracteal leaves in upper part of compound spike greatly exceeding it); in some cases not one or two but many capitula aggregate in secondary axillary spicate inflorescences. Involucral bracts about 20–25, usually four-rowed, brownish or straw-colored, less often greenish, membranous, usually with distinct brown spot or band in upper part; outer bracts ovate, more or less pubescent on back, one-third to half as long as inner oblong and innermost more or less spatulate bracts, tapered to base. Florets in fully developed capitulum about 70, only three bisexual. Pappus of 25–35 fine, white (hyaline), somewhat toothed hairs, more or less as long as corolla and connate into ring at base; achenes brown, oblong-prismatic, often 399 distinctly angular, covered with short, spreading, whitish (hyaline) hairs. Flowering VI–IX.

Plains up to middle montane zone in open forest glades and cut-over areas, edges and shrub thickets, dry meadows and fallow lands. —*European Part*: All regions excluding extreme north; *Caucasus*: Almost all regions, but rarely in southern Transcaucasia and doubtfully from Talysh; *Western Siberia*: All regions; *Eastern Siberia*: Lena-Kolyma (rarely!), Angara-Sayans, Dauria; *Far East*: Sakhalin and Kuril islands; *Soviet Central Asia*: Aralo-Caspian and Balkhash Region (literature records). *General distribution*: Scandinavia, Central Europe, Atlantic Europe, Mediterranean, Balkans-Asia Minor, Armenia and Kurdistan, northern Mongolia (according to N.V. Pavlov, op. cit.), North America. Described from western Europe. Type in London.

Note. In the contact zones with *G. norvegicum* Gunn. and *G. caucasicum* S. and L., it evidently hybridizes with these species, producing intermediate forms.

Within its wide range *G. sylvaticum* L. is comparatively uniform. Most often the size of the plant, shape of the capitula, color of the involucral bracts, and sometimes also other characters (for example, pubescence) vary. This variation is, however, in the nature of modifications of no serious taxonomic significance. Therefore, the establishment of the numerous infraspecific taxa in *G. sylvaticum* (varieties, forms, etc.) repeatedly split off by western European botanists is hardly wise. All the more, there is no justification at all for the uncritical transfer to our *Flora* of insignificant variations based on material collected far beyond the borders of our country as was done, for example, by Syreistschikov in his "*Illustrirovannaya flora Moskovskoi gubernii* [Illustrated Flora of Moscow Province]."

10. **G. norvegicum** Gunn. Fl. Norv. II (1766) 105; Br.-Bl. in Vierteljahr. Naturf. Ges. Zürich LXII (1917) 616; Briq. and Cav. in Burnat. Fl. d. Alpes. Marit. VI, 2 (1917) 255; Hegi, Ill. Fl. VI, 1, 464; Govorukhin, Fl. Urala. 488; Pavlov, Fl. Tsentr. Kazakhst. III, 230; Krylov, Fl. Zap. Sib. XI, 2700; Vizn. Rosl. URSR, 527. —*G. fuscum* Lam. in Dict. Encycl. II (1788) 757, non Scop. —*G. strictum* Moench, Meth. (1794) 576.—*G. fuscatum* Pers. Syn. II (1807) 421. —*G. sylvaticum* β. *fuscatum* Wahlenb. Fl. Lapp. (1812) 205; Fellm. in Bull. Soc. Nat. Mosc. III (1831) 299; DC. Prodr. VI, 232. —*G. sylvaticum* α. *brachystachys* Ldb. Fl. Alt. IV (1833) 57. —*G. sylvaticum* α. *brachystachyum* Ldb. Fl. Ross. II, 2 (1845–1846) 610; Krylov. Fl. Alt. III, 601. —*G. silvaticum* var. *norvegicum* (Gunn.) B. Fedtsch. and Fler. in Fedtsch. and Fler. Fl.

Evrop. Ross. (1910) 958. —*G. subalpinum* Neilr. apud. O. and B. Fedtsch. in Perech. Rast. Turk. IV (1911) 209, nomen. —*G. norvegicum* Gunn. ssp. *chamarense* Sukacz. in Dnevn. Vses. Sezda Bot. (1928) 129. — *Omalotheca norvegica* Schultz. fr. Arch. de Flore (1861) 311. — *Gamochaeta norvegica* Gren. Fl. Ch. Jurass. (1869) 427.—*Synchaeta*
400 *norvegica* Kirp. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR XX. — **Ic.**: Rchb. Icon. Fl. Germ. et Helv. XVI (1853) 949, fig. II (color.); Fedtsch. and Fler. op. cit., Fig. 956; Hegi, op. cit. fig. 234, d–h; Lindman, Bild. Nord. Fl., ed. 2/3, III (1926), tab 527, fig. 5–7 (color. opt.); Javorka and Czapody, Iconogr. Fl. Hungar. (1933), tab. 513, fig. 3671 (bona); Dostal, Klič (1954) fig. 2301 (bona). —**Exs.**: Fellman, Pl. Arct. No. 129; Martianow, Pl. Minusinensis exs. No. 555; Pl. Finl. exs. No. 1381; F. Petrak. Fl., Bohem. et Morav. exs. No. 792; Pl. Polon. exs. No. 166; F. Schultz, Herb. norm., cent 5, No. 499 bis ("*Omalotheca norvegica*").

Perennial. Rhizome cylindrical, slender, usually 2–3 mm wide; stems solitary, less often two or many, erect, grayish-tomentose, somewhat weakly leafy. Leaves lanceolate, acute; upper leaves sessile or subsessile, middle ones short- or long-petiolate, lower ones long-petiolate; lamina greenish and sparsely arachnoid-tomentose above, grayish-green or more often canescent beneath from rather dense arachnoid-tomentum or lamina lanate-tomentose; lower leaves at least with three distinct veins, usually 8–12 mm wide in broader part of lamina. Capitula narrow-campanulate, 5–8 mm long and 4–7 mm wide, in dense and compact terminal spicate inflorescence; bracteal leaves divergent (and sometimes even exceeding; only rarely these leaves not conspicuous or almost so); sometimes splicate inflorescences discontinuous in lower part or remote, and then capitula in groups of one or two or a few in axils of bracteal leaves. Involucral bracts about 20–25, usually three-rowed; outer bracts ovate, not more than half as long as inner, lustrous, with broad, dark- or blackish-brown border; inner bracts lanceolate or oblong, green in lower part on the back and brown or dark brown in upper part, membranous along margin. Florets in capitulum usually 35–40; bisexual florets few (usually four or five). Pappus of about 25 fine, white-sericeous, somewhat toothed hairs, connate at base into ring, hairs more or less as long as corolla; achenes oblong, brown, distinctly angular, about 1.5 mm long, covered with short, white (hyaline) hairs. Flowering VII–IX.

Subalpine zone, usually near upper limit of forests, mountain tundras and mountain meadows, sometimes below lower limit of forests; also in arctic zone; turfy places and rocks, granite outcrops, stony banks of rivers and streams, edges of willow, birch, and cedar forests, tundra and rarely borders of upland marshes, often in the so-called zone of white and bald mountains. —*Arctic*: Arctic Europe, Arctic Siberia (extreme west); *European Part*: Karelia-Lapland, Dvina-Pechora, Volga-Kama, Upper

Dniester; *Western Siberia*: Ob Region (extreme southeast), Irkutsk, Altai; *Eastern Siberia*: Lena-Kolyma (southwestern Trans-Baikal), Angara-
401 Sayans, Dauria (Khamar-Daban); *Soviet Central Asia*: Balkhash Region (eastern part, rarely), Dzhungaria-Tarbagatai, Tien Shan (eastern part, rare); *General Distribution*: Arctic (Greenland), Scandinavia (including Iceland), central Europe, western Mediterranean, Balkans, Dzhungaria-Kashgaria, North America, (Canada). Described from Norway.

Note. Probably *G. norvegicum* Gunn. hybridizes with *G. sylvaticum* L. and as a result transitional forms are sometimes observed in the contact zones of both species.

11. **G. caucasicum** Somm. and Lév. in Nuovo Giorn. Bot. Ital., nov. ser., II (1895) 85; Grossh. Opredel. Rast. Kavk., 444; Kolak. Fl. Abkhaz. IV, 208; A. Shkhiyan in Fl. Gurz. VIII, 263. —*G. caucasicum* Lescov ex Grossh. Fl. Kavk. IV (1934) 102. —*Synchaeta caucasica* Kirp. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XX. —*G. norvegicum* auct. nonn. Fl. cauc. non Gunn. Boiss. Fl. or. III (1875) 226; Lipski, Fl. Kavk., 344. —**Ic.**: Fl. Gruz. VIII, 265, Fig. 384 (ic. mediocr., tantum habitus).

Perennial. Rhizome cylindrical, slender, usually 2–3 mm thick; stems solitary or less often two to several, simple, erect, (8)12–20(35–40) cm high, gray tomentose or velutinous tomentose pubescent. Leaves lanceolate or linear-lanceolate with prominent midrib, and distinct cusp, greenish or green with brownish tinge and weakly tomentose pubescent above, whitish-grayish, densely tomentose pubescent beneath; cauline leaves sessile or short-petiolate, basal ones long petiole. Capitula narrow-campanulate to almost cylindrical, in more or less compact terminal spike with bracteal leaves often spreading; one or two or several capitula (less often the entire, small, secondary spike) arising in axils of bracteal leaves; often spike in lower part or throughout more or less lax. Involucral bracts about 20–30, three- or four-rowed; outer bracts rotund-ovate or ovate, not more than half as long as inner ones, with broad, dark or somewhat dark brown, border, on the back rather densely arachnoid pubescent; inner bracts narrow-ovate or lanceolate-oblong and oblong-linear, brown or dark brown in upper part, with green spot below and slightly tomentose pubescent on the back. Florets in capitulum usually 40–50; bisexual florets few (usually four or five). Pappus of 25–30 fine, white, barbed hairs, more or less as long as corolla, connate at base into indistinct ring; achene oblong, light brown or yellowish-brown, about 1.3 mm wide, with very short white (hyaline) hairs. Flowering VII–VIII. (Plate XXIV, Fig. 2).

At 1,400–2,700 m; openings (most often only in upper forest belt), shrub thickets (particularly of rhododendrons), subalpine and lower part
402 of alpine zone on herbaceous slopes and meadows that are mowed.

—*Caucasus*: Ciscaucasia, western, eastern and southern Transcaucasia. *General distribution*: Armenia and Kurdistan. Described from Abkhazia. Type in Florence.

Note. The species is quite close to *G. norvegicum* Gunn. to which it undoubtedly is phylogenetically related. Sometimes, probably, it hybridizes with *G. sylvaticum* L.

One cannot rule out the possibility that *G. alpigenum* C. Koch. (in *Linnaea* XXIV, 1851, p. 354) is identical with *G. caucasicum* Somm. and Lev., and in this case Koch's name has priority. However, the imprecise diagnosis of Koch and quite vague geography mentioned by him ("in Kaukasischen Hochgebirge ...") make it impossible to judge exactly about the type of plant taken as the basis for the description of *G. alpigenum*. Boissier, having seen the specimens of Koch, referred them, for some reason or other, to *G. sylvaticum* L., although according to the description *G. alpigenum* C. Koch is much closer to *G. norvegicum* Gunn. V.I. Lipsky in his *"Flora Kavkaza"*; after him A.A. Grossheim and other Caucasian taxonomists generally greeted the question of the identity of *G. alpigenum* C. Koch with silence.

Subgenus III. **Omalotheca** Endl. Gen. pl. (1838) 447 ("*Homalotheca*"). —*Omalotheca* Cass. in Dict. Sc. Nat. LVI (1828) 218; DC. Prodr. VI (1837) 245; Kirp. in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, 9 (1950) 30. —*Omalotheca* subgen. *Euomalotheca* Schultz. fr. in Arch. de Flore (1861) 311. —Capitula aggregated in dense or lax spicate inflorescences or (sometimes) solitary; peripheral pistillate florets usually one-whorled; pappus of comparatively thick, free hairs (bristles), falling separately; pollen grains not clearly distinguished from those of the representatives of the subgenus **Synchaeta**.

Perennial, usually stocky herbaceous plants, confined mainly to the alpine and subalpine zones.

Type of subgenus: *Gnaphalium supinum* L.

12. **G. supinum** L. Syst. nat. ed. 12, III (1768) 234; Ldb. Fl. Ross. II, 610; Fedtsch. and Fler. Fl. Evrop. Rose. 959; O. and B. Fedtsch. Perech. Rast. Turk. IV, 209; Br.-Bl. in Vierteljahr. Naturf. Ges. Zürich LXII (1917) 916; Briq. and Cav. in Burnat. Fl. d. Alpes Marit. VI, 2 (1917) 273; Hegi, Ill. Fl. VI, 1466; Grossh. Fl. Kavk. IV (1934) 101 and Opredel. Rast. Kavk., 444; Krylov, Fl. Zap. Sib. XI, 2702. —*G. fuscum* Scop. Fl. Carn. ed. 2, II (1772) 152 and tab. 57, non Lam. —*G. supinum* β. *subacaule* Wahlenb. Fl. Lapp. (1812) 204; Fellm. in Bull. Soc. Nat. Mosc. VIII (1835) 279; Grossh. Fl. Kavk. IV, 101. —*G. acaule* Sieber ex Fisch. and Mey. apud DC. Prodr. VI (1837) 245, nom. in synon.
403 —*G. supinum* var. *typicum* Trautv. in Tr. Peterb. Bot. Sada II (1873) 549.

—*Filago acaulis* Krock. Fl. Siles. II, 2 (1790) 498. —*Omalotheca supina* Cass. in Dict. Sc. Nat. LVI (1828) 218; DC. Prodr. VI (1837) 245. —*Omalotheca supina* Cass. β. *subacaulis* DC., op. cit. —**Ic.**: Hegi, op. cit. f. 236; Javorka and Czapody, Iconogr. Fl. Hungar. (1933), tab. 513, fig. 3670 (bona); Dostal. Klič (1954), fig. 2305; Hegi, Alpenflora, 13, Aufl. (1956), tab. 29, fig. 9 (color.). —**Exs.**: Balansa, Pl. d'Or. 1866, No. 1482; Billot. Fl. Gall. et Germ. exs. No. 1006; Fellman, Pl. Arct. No. 130; Fl. exs. Austro-Hung., No. 1792; Fl. exs. Rhen. No. 28; Fl. Polon. exs. No. 168; Pl. Finl. exs. No. 972; F. Schultz. and F. Winter, Herb. norm. cent. 1, No. 69.

Perennial. Plants often forming more or less pronounced tussocks; rhizome slender, producing long filiform roots. Stems short, (1)5–12(18) cm high, slender, simple, erect or somewhat bent, solitary or few (rarely rather numerous), gray- or whitish tomentose pubescent. Cauline leaves many, crowded in a rosette at base of stems; all leaves linear or linear-lanceolate, acute, narrow, usually 1.0–2.5 mm wide, on both sides pilose or more often tomentose, or arachnoid-tomentose pubescent. Capitula many, in terminal, dense or lax spicate inflorescence, or capitula only one or two. Involucral bracts three- or four-rowed, often carinate (particularly after flowering), in lower part greenish, at tip brown or almost blackish-brown, after fruiting often stellately spreading; outer bracts ovate or oblong-ovate, more or less densely pubescent on the back; inner bracts oblong-ovate to oblong-linear, at tip more or less distinctly broadened. Pistillate florets one-whorled, filiform; styles often exserted from florets; bisexual florets usually six to eight. Pappus of 20–25(35) barbed hairs (bristles), more or less as long as corolla and falling singly; achenes rather densely (sometimes very densely) covered with white, somewhat setaceous hairs, often forming coronate structure at apex; distinctly narrowed to base, with papillose, truncate, disk. Flowering (VI)VII–VIII (IX).

At altitudes up to 4,000 m. Alpine and (sometimes) subalpine zones, meadows and stony places, often also at the foot of glaciers and snow patches; at higher latitudes found at considerably lower altitudes in mountain tundras as well as in different types of tundras and on plains. *G. supinum* L. is an arctic-alpine species, which in alpine areas is often a pioneer colonizer and mat-former of the soils. —*Arctic:* Arctic Europe, Arctic Siberia (extreme west, rarely!); *European Part:* Kara Kum-Lapland, Dvina-Pechora, Volga-Kama (Polar and Northern Urals), Upper Dniester; *Caucasus:* All regions except Talysh; *Western Siberia:* Ob Region (western part adjoining the Polar and northern Urals), Altai; *Soviet Central Asia:* Dzhungaria-Tarbagatai, Tien Shan. *General distribution:* Arctic, Scandinavia, Central Europe, Atlantic Europe, Balkans-Asia Minor, Armenia and Kurdistan, Dzhungaria-Kashgaria, North America. Described from the Alps of Switzerland and Italy. Type in London.

Note. As circumscribed by us, *G. supinum* L. s. l. represents a complicated polytypic complex consisting of a considerable number of races, which should be subjected to review and study. The circumpolar group of races, distributed from the mountains of extreme western Europe 404 to North America, differs from the ancient montane Mediterranean group of races, although there is no doubt about a close phylogenetic relationship between them. European botanists repeatedly have tried to reflect the polymorphism of *G. supinum* L. (in materials from western Europe as well as European Part of the USSR) by erecting numerous forms or varieties (see Braun-Blanquet, op. cit. pp. 616–617) whose taxonomic significance is more or less negligible.

G. hoppeanum C. Koch, mentioned by M.G. Popov [in *Tr. Uzbeksk. Gos. Univ., Nov. Ser.*, No. 27, *Biol.*, No. 14 (1941) 62], is in fact found nowhere in Soviet Central Asia; it is a purely European species. The plant understood by M.G. Popov as *G. hoppeanum* is nothing other than *G. supinum* L., as circumscribed by us.

GENUS 1493. **Helichrysum** [1, 2]

Mill. Corr. Pers. nom. conserv.; Mill. Gard. Dict. Abridg. ed. 4 (1754), sub. *Elichrysum*; corr. Pers. Syn. II (1807) 414. —*Gnaphalium* L. Sp. pl. (1753) 850, p. p. —*Cyttarium* Peterm. Fl. lips. exc. (1838) 608, p. p

Capitula homogenous or heterogamous, with small or often considerable number of fertile bisexual florets; innermost florets of homogamous capitula often sterile; peripheral florets of heterogamous capitula pistillate, filiform, in one more or less complete whorl. Capitula (in Soviet species!) small, rarely exceeding 4–7(20) mm in width, solitary or many, terminal on branches, usually 10 to 50 (sometimes up to 100 and more) aggregated in compound corymbose or capitate inflorescence. Involucral bracts usually scarious, often bright colored, compactly or more or less loosely imbricate in a few (three) or more (four to seven) rows, after flowering sometimes spreading. Receptacle slightly convex or flat, less often almost conical, glabrous, punctate or alveolate, often with irregular small teeth. Corolla of bisexual florets tubular, apically with five (rarely four) teeth, usually glandular on the outer side. Pistillate

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[1] Treatment by M.E'. Kirpicznikov.

[2] The etymology of the generic name is not clear. According to one version it is derived from the Greek words *helix*—spiral and *chrysos*—gold; according to another, from the Greek words *helios*—sun, and *chrysos*—gold (the name indicates the golden-colored involucral bracts often found in the species of this genus). See Ruprecht (*Flora Ingrica*, 1860, p. 571) for more details about the etymology of *Helichrysum*.

florets, if present, filiform, apically somewhat toothed. Anthers linear, at base with filiform appendage. Pollen grains spherical, with germ pores slightly undulate along margin, exine thick and spiny, intine scarcely visible. Style slender, often basally bulged; style branches linear, more or 405 less flat, at apex truncate or capitate. Achenes ellipsoid, terete, or irregular prismatic, often four- or five-angled, usually covered with transparent papillae or sometimes sericeous-lanate. Pappus (in indigenous species!) one-rowed, of fine, barbed, sometimes apically brush-like or plumose, the hairs falling singly or connate at base as one. Base chromosome number $x = 7$.

Perennial (rarely annual) herbs or semishrubs or even shrubs (tropics and subtropics) of quite a diverse habit, but often gray from covering of tomentose pubescence. Leaves alternate (only sometimes lower leaves opposite), entire.

The genus *Helichrysum* s. l. includes more than 500 species found in the hot and temperate zones of the Old World, most abundantly in the South African region (Cape Peninsula, Island of Madagascar, and Mascarene Islands), and Australia and also Asia Minor; the number of species indigenous to the rest of Asia and Europe is limited.

Type species: *Helichrysum orientale* Gaertn.

The taxonomic significance of many of the characters in the genus *Helichrysum* (as in all the *Gnaphalinae* s. l. and often in other Compositae as well) is not established so far. This applies in particular to the glandular hairs of the vegetative organs and achenes, as well as to the shape of the capitula and the color of the involucral bracts. In many cases it may be considered proven that these characters vary depending on age or on comparatively small changes in the habitat; apart from this, the presence of glands sometimes is simply masked by arachnoid-tomentose pubescence if, for any reason, it develops more strongly than usual. The correct taxonomic evaluation of the nature of the vestiture of the vegetative organs, color of the involucral bracts and remaining relatively easily distinguished external morphological characters would have great significance for an understanding of the genus *Helichrysum*. The lack up until now of unanimity in the point of view in assessing the significance of one or the other character leads authors to different extremes: to a concept of the species in the genus *Helichrysum* that is either unjustifiably broad or too narrow. Comparatively simple but specific observations in the field or under experimental conditions could help to work out objective criteria which could play a significant role in deciphering the complicated history of the species of this genus. At present, the demarcation of species in the genus *Helichrysum* is a difficult task. For the group *Stoechadin*, to which belong the species of flora of the USSR, Boissier (*Fl. Or.* III, 1875, 228) established two taxonomic categories of uncertain value, namely *Oligophylla* and *Imbricata*. Unfortunately, even this formal division having value as a key to identify the species, was shaken already by the author himself and later by his followers, who erred in counting the number of involucral bracts, leading to a misinterpretation (see, for example, E.B. Bordzilovskii in *Vestn. Tifl. Bot. Sada, Nov. Ser.*, No. 4–5, 406 1928–1930, 1931, p. 63; P.H. Davis in *Notes from the Royal Botanical Garden Edinburg*, Vol. XXII, 2, 1956, p. 78).

To use the key that follows for identification, it is necessary to have fully mature and well developed specimens. Even so, completely certain identification of the species of *Helichrysum* is hardly possible without pulling together material for comparison. This is because of the great polymorphism of almost all helichrysums [everlastings and strawflowers] and also because of the fact that specific differences among the members of the genus *Helichrysum* are far from striking and only with considerable effort yield any diagnostic characters. In herbaria, a significant percentage of the specimens of the genus *Helichrysum* are poor representatives, often only in the immature stage; very often the root system is entirely missing, causing serious diagnostic consequences in many cases. For further study in depth of *Helichrysum* it is desirable to have new carefully made, complete collections.

Economic Importance. In floriculture, the so-called everlastings (strawflowers, immortelles), used to make beautiful bouquets lasting for years, represent mainly species of the genus *Helichrysum* s. l. The most widely cultivated is *H. bracteatum* (Vent.) Willd., a native of Australia. Many wild everlastings in the USSR, particularly the most striking *H. callichrysum* (F. and M.) DC., deserve to be introduced into cultivation. Some everlasting species are valuable medicinal plants.

1. Low branching, lead-gray pubescent plant, forming quite dense beds. Flowering stem (2)5–12(15) cm high. Species of alpine zone of Armenian SSR (Zangezur Range) and Nakhichevan ASSR ....15. **H. pallasii** (Spreng.) Ldb.

+ Plants not forming beds, usually taller..2

2. Capitula large, (12)15–18(20) mm wide, globose or flattened-globose, in groups of two or three (rarely more), or sometimes solitary terminal; involucral bracts lustrous golden, with more or less distinct longitudinal folds, numerous, lax, six- or seven-rowed. Species of upper montane and alpine zones of Armenian SSR (Daralagyoz) and Nakhichevan ASSR.. ....13. **H. callichrysum** (Fisch. and Mey.) DC.

+ Capitula smaller...3

3. Pappus distinctly longer (by one-third to one-fourth) than corolla; pappus hairs apically narrowly tufted; capitula usually about 10

mm wide; involucral bracts 60–70, lustrous golden, rather compactly arranged in six or seven rows, usually distinctly exceeding disk; florets 70–80. Plant of upper montane zone, sometimes found only in Armenian SSR in regions bordering Turkey...14. **H. polylepis** Bordz. ex Grossh.

407 + Pappus not much longer than corolla; pappus hairs without tufted tip; capitula usually smaller..4

4. Dwarf plant, (4)7–12(18) cm high, with herbaceous flowering stems, terminating in compact capitate corymb of (5)8–15(20) capitula; involucre somewhat longer than floret; bracts 30–50, orange or golden orange, four- or five-rowed. Species of alpine zone, sometimes found only in Armenian SSR in regions bordering Turkey......................16. **H. aurantiacum** Boiss. and Huet.

+ Plants much taller or involucral bracts colored differently...........5

5. Capitula usually two to six, often in compact, almost capitate corymb; involucral bracts brownish-yellow, pale straw-colored or whitish, approximately 40; florets about 20 in capitulum; leaves revolute, usually linear, 1.5–2.5 cm long and 1–2 mm wide. Plant together with vegetative shoots forming small compact tussock. Endemic to Nuratau Range (Uzbek SSR)...6. **H. nuratavicum** Krasch.

+ Capitula more numerous; involucral bracts usually colored differently; florets usually more than 20 in capitulum; leaves, as a rule, larger...6

6. Involucral bracts brownish-orange, brownish, or brownish straw-colored, about 30; capitula usually in more or less compound corymb; florets about 30 in capitulum; leaves acute, often with brownish tip. A Pamiro-Alai species (Turkestan, Zeravshan and Hissar ranges)...5. **H. mussae** Nevski

+ Involucral bracts of different color...7

7. Plants lanate-tomentose, lacking glandular pubescence..............8

+ Plants with stem or leaves (or both) glandular-pubescent............13

8. Capitula obconical or narrow campanulate; involucral bracts yellow; pappus of more or less 40 hairs; flowering stems usually branched, with slender shoots. Species of foothills and mountains of Tadzhikistan......................................4. **H. thianschanicum** Rgl.

+ Capitula broadly obovate and subspherical to cylindrical; involucral bracts variously colored; pappus of 25–30 hairs; flowering stems simple..9

9. Florets about 25–30 in capitulum; involucral bracts sulfur- or straw-yellow, or whitish (but not reddish); relatively robust plant, usually 50–60 cm high with strong woody flowering stems. Species found in the Kopetdag Mountains...3. **H. kopetdagense** Kirp.

+ Florets about 36–65 in capitulum; involucral bracts variously colored (sulfur-, pale-, straw-, lemon-yellow, or whitish, sometimes pink, brick-red, and orange)..10

408 10. Corymb together with bracteal leaves densely arachnoid-tomentose pubescent (particularly on one side); involucral bracts usually nonuniformly langitudinally plicate, lemon-yellow or sulfur-lemon yellow, lustrous; florets about 50–65 in capitulum. Species of subalpine and lower part of alpine zones, found in Crimea and Transcaucasia.............10. **H. graveolens** (M.B.) Sweet.

+ Corymb not densely arachnoid tomentose pubescent at apex.....11

11. Involucral bracts slightly longitudinally plicate. Plants of Soviet Central Asian mountains (see also couplet 15)..9. **H. maracandicum** M. Pop. ex Kirp.

+ Involucral bracts longitudinally not plicate. Plants, if found in Soviet Central Asia, not reaching high in the mountains...........12

12. Leaves (at least some) usually undulate; florets about 50 in capitulum; pappus of more or less 25 whitish hairs. Plants usually of open places, found in Transcaucasia (including Talysh) and reaching to 2,000 m..................................2. **H. undulatum** Ldb.

+ Leaves flat or slightly involute; florets (25)35–44(50) in capitulum; pappus of about 30 yellowish or almost white hairs. Plants usually not occupying high elevations in mountains; often found in pine groves and open places (sandy and chalky mounds, dunes, etc.) and widely distributed in most regions of the European part of the USSR, in the northern Caucasus, sometimes in Siberia (almost exclusively in western Siberia) and a number of regions of Soviet Central Asia.................1. **H. arenarium** (L.) Moench

13. Robust, woody, many-headed root forms several layers of usually obliquely upright branches; stem not sulcate or not clearly so...14

+ Woody root not forming several layers of branches; stem, as a rule, clearly finely sulcate..15

14. Capitula usually 6–9 mm wide and about 7 mm long; involucral bracts sulfur- or lemon-yellow, sometimes golden, less often milky-white (var. *lacteum* Boiss.). Species found in mountains of Transcaucasia...............11. **H. armenium** (Fisch. and Mey.) DC.

+ Capitula usually 2–3(4) mm wide and about 5 mm long; involucral bracts pale yellow or whitish, with green stripe. Species growing in southwest of Transcaucasia and possibly in Talysh ....12. **H. araxinum** Takht. ex Kirp.

15. Bulbous thickening of sterile stems more than 5 mm thick, usually densely flocculose-arachnoid pubescent; leaf bases
409 pulvinate, often membranous, sometimes turning red and with

prominent veins; involucral bracts usually spreading after fruiting or else involucre becoming cup-shaped. Plants of mountains of Soviet Central Asia............9. **H. maracandicum** M. Pop. ex Kirp.

+ Bulbous thickening of sterile stems up to 5 mm thick or inconspicuous; involucral bracts usually not spreading after fruiting, and involucre not becoming cup-shaped. Plants growing in mountains of the Caucasus...16

16. Bulbous thickening of sterile stems usually absent; leaves often more than 5 mm wide, usually dark green, sometimes slightly tomentose. Species endemic to Adzhar-Imeretian Range.......... ....7. **H. polyphyllum** Ldb.

+ Bulbous thickening of sterile shoots conspicuous; leaves most often grayish-green and usually just about 5 mm wide. Species found in eastern and southern Transcaucasia........................... ....8. **H. plicatum** (Fisch. and Mey.) DC.

Subgenus **Helichrysum**. —Sect. **Helichrysum** Less. Synops. Composit. (1832) 274, p. p. —Sect. *Euhelichrysum* DC. Prodr. VI (1837) 169, p. p. —Subgen. *Euhelichrysum* Benth. in Benth. and Hook. Gen. pl. II (1873) 310, p. p. —Receptacle glabrous, usually regular alveolate, alveolae more or less separated by distinctly projecting toothed, sinuate appendages. Pappus of fine barbed hairs.

Type of subgenus: Type of genus.

Section 2. HELICHRYSUM. —Sect. *Euhelichrysum*. ser. II. *Chrysolepidea* §l. *Stoechadina* DC. Prodr. VI (1837) 181. —Sect. *Stoechas* Benth. in Benth. and Hook. Gen. pl. II (1873) 311, p. p. —Perennial herbs or semishrubs. Base of sterile stems often bulbous; capitula usually many-flowered; involucral bracts imbricate, more or less lemon- or sulfur-yellow, less often golden, pinkish, orange, whitish or milky-white; corolla in upper part glandular, pappus of fine, uniform, somewhat barbed hairs, united at base by cell processes in a usually fragile ring; achenes oblong, terete or irregular prismatic, more or less distinctly angular, small (0.5–2 mm long), brownish, with glandular papillae.

Type of section: Type of genus.

Series 1. Arenaria Kirp. —Involucral bracts lax, variously colored; sulfur-lemon yellow, pale or straw-yellow, as well as pinkish, pink, or orange. Corymb of (5)10–30(up to 100) capitula; lanate-tomentose plants growing usually in low-lying areas, foothills and in mid-montane zone. 410

1. **H. arenarium** (L.) Moench, Meth. (1794) 575 (*Elichrysum arenarium*): Fedtsch. and Fler. Fl. Evrop. Ross. 959; Pavl. Fl. Tsentr. Kazakhst.

III, 231; Majevski, Flora, Ed. 8 (1954) 569; Kirp. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XX. —*H. arenarium* (L.) DC. in Lam. and DC. Fl. Franc. IV (1805) 132; Ldb. Fl. Ross. II, 2, 607 (incl. β. *prostratum* Ldb.); O. and B. Fedtsch. Perech. Rast. Turk. IV, 207; Hegi, Ill. Fl. VI, 1,. 471; Grossh. Fl. Kavk. IV (1934) 104 and Opredel. Rast. Kavk. 446; Krylov, Fl. Zap. Sib. XI, 2703; Karavaev, Konsp. Fl. Yakutii, 168. —*H. arenarium* β. *aurantiacum* Pers. Synops. pl. II (1807) 418; DC. Prodr. VI, 184. —*H. buchtormense* DC. ibid. —*H. arenarium* α. *sabulosum,* β. *campestre* 1. *elatius* and 2. *latifolium* Gruner in Bull. Soc. Nat. Mosc. XLI (1869) 420. —*H. arenarium* var. *roseum* Trautv. in Tr. Petereb. Bot. Sada (1871) 23, p. p.; Fedtsch. and Fler. op. cit. 960. —*H. arenarium* α. *congestum,* β. *laxe-corymbosum,* and γ. *pallidum* Lindem. in Bull. Soc. Nat. Mosc. XLV (1872) 298, 299. —*H. tanaiticum* P. Smirn. in Byull. Mosc. Obshch. Ispyt. Prir. XLIX, 2 (1940) 87.—*H. corymbiforme* (*corymbiformis*) Opperm. in Vizn. Rosl. URSR (1950) 528 (descr. brev. ucr.). —*H. corymbiforme* Opperm. ex Katina in Botanichn. Zhurn. IX, 3 (1952) 87 (descr. latina). —*Gnaphalium arenarium* L. Sp. pl. (1753) 854; Schmalh. Fl. II, 47. —*G. stoechus* auct. fl. Ross. non L.: Pallas, Reise I (1771) 207; Falk. Beitr. II (1786) 239; Güldenst. Reise I (1787) 113 and II (1791) 171 and pag. caet. Georgi. Phys.-geogr. Beschreib. Russ. R. III, 4 (1800) 1237. —*G. elichrysum* Pallas, Reise III (1776) 537. —*G. aureum* Gilib. Fl. Lithuan. III (1781) 179. —*G. graveolens* Henning in Mém. Soc. Nat. Mosc. VI (1823) 79, non M.B. —*Stoechas citrina* Güldenst. Reise II (1791) 202, 205 and pag. caet. —**Ic.**: Fedtsch. and Fler., op. cit., Fig. 958; Syreistsch. Ill. Fl. Moskovsk. Gub. III (1914), Str. 248; Fl. Yugo-Vost. VI (1936), Fig. 669; Rchb. Ic. Fl. Germ. et Helv. XVI (1854) tab. 59 (CML), fig. 1 (color); Hegi, op. cit. tab. 261, fig. 1; Lindman, Bild. Nord. Fl., ed. 2/3, I (1922), tab. 27 (color., mediocr.); Bonnier, Fl. Compl. Ill. France, Suisse et Belg. VI (1923), tab. 306, fig. 1523 (color., mediocr.); Javorka and Czapody, Iconogr. Fl. Hungar. (1933), tab. 513, fig. 3673 (bona) and tab. color. 37 (1934). —**Exs.**: GRF No. 179; Kar. and Kir. Nos. 564, 1614; Pabo and Cholovskii, Gerb. Mogilevks, Gub., sine numero; Tarachkov and Poganko, Gerb. Orlovsk. Gub., sine numero; Novopokr. Gerb. Donsk. Fl. No. 96; Pl. Polon. exs. No. 169; Fl. exs. austrohung. No. 238 (sub *Gnaphalio arenario*); Fl. Hung. No. 905; Callier, F. Siles, exs. No. 1094; Fl. exs. Boh.-Slov. No. 930; Fl. Boh. et Morav. exs. No. 259; Kickxia Belgica, No. 38.

Perennial. Plant tomentose-lanate pubescent, often forming more or less dense tussock; root woody, usually thick, 5–7(15) mm or (on light, well drained soils) considerably thinner, only 1–4 mm thick; flowering
411 stems few or many, erect or ascending, simple, (7)15–30(60) cm high, at base often with remains of dead leaves; growing leaves with brownish cusps (not always distinct), gradually reduced upward, upper and middle

leaves sessile, lanceolate-linear or linear, lower lanceolate or spatulately linear, petiolate; leaves of sterile stems oblong-spatulate, oblong-obovate, or oblong-elliptical, gradually narrowed in petiole. Capitula in groups of (5)10–30(up to 100) in compact or even compound corymb, almost spherical or broadly obovoid, (3)4–6(9) mm wide on peduncles of unequal length; young corymbs capitate, usually enclosed by few bracteal leaves. Involucral bracts about 50, lax, in (three)four to six(seven) rows, often recurved by end of flowering, bright lemon-yellow or (rarely!) paler yellow, or even pinkish (particularly inner bracts), or, finally, orange; outer bracts obovate or elliptical, on the back velutinous, inner broad or oblong-spatulate to almost linear. Florets (25)35–45(50), usually bisexual, sometimes peripheral florets pistillate, from a few to complete whorl, pappus of about 30 very fine, soft, barbed, yellowish or almost white hairs, more or less as long as corolla. Flowering V–IX (usually VI–VIII).

Dry sandy, as well as loamy-sandy and stony soils, chalks, in southeast of European part and in Soviet Central Asia also on solonchak soils; dunes, hills and slopes; pine woods, steppe meadows, steppes and (sometimes!) semi-deserts. —*European Part*: Almost all regions excluding Arctic, Karelia-Lapland and Dvina-Pechora; *Caucasus*: Ciscaucasia, Dagestan; *Western Siberia*: Upper Tobol, Irtysh, Altai; *Eastern Siberia*: Lena-Kolyma (very rarely!), Angara-Sayans; *Soviet Central Asia*: Aralo-Caspian, Balkhash Region, Dzhungaria-Tarbagatai, Tien Shan. *General distribution*: Scandinavia, Atlantic Europe, Balkans-Asia Minor, Mongolia, China (personal communication from Professor Lin). Described from Europe. Type in London.

Note. It is an aggregated species whose truly natural races can only be established, it seems to us, by a separate monographic study of the entire *H. arenarium* (L.) Moench. s. l. complex. Individual efforts made in this regard abroad as well as in the USSR (P.A. Smirnov, Z.F. Katina) seem to us in large part hardly successful, because one of the basic conditions set forth for the establishment of races has not been observed in these efforts: the diagnostic characters must be stable not only morphologically but also geographically.

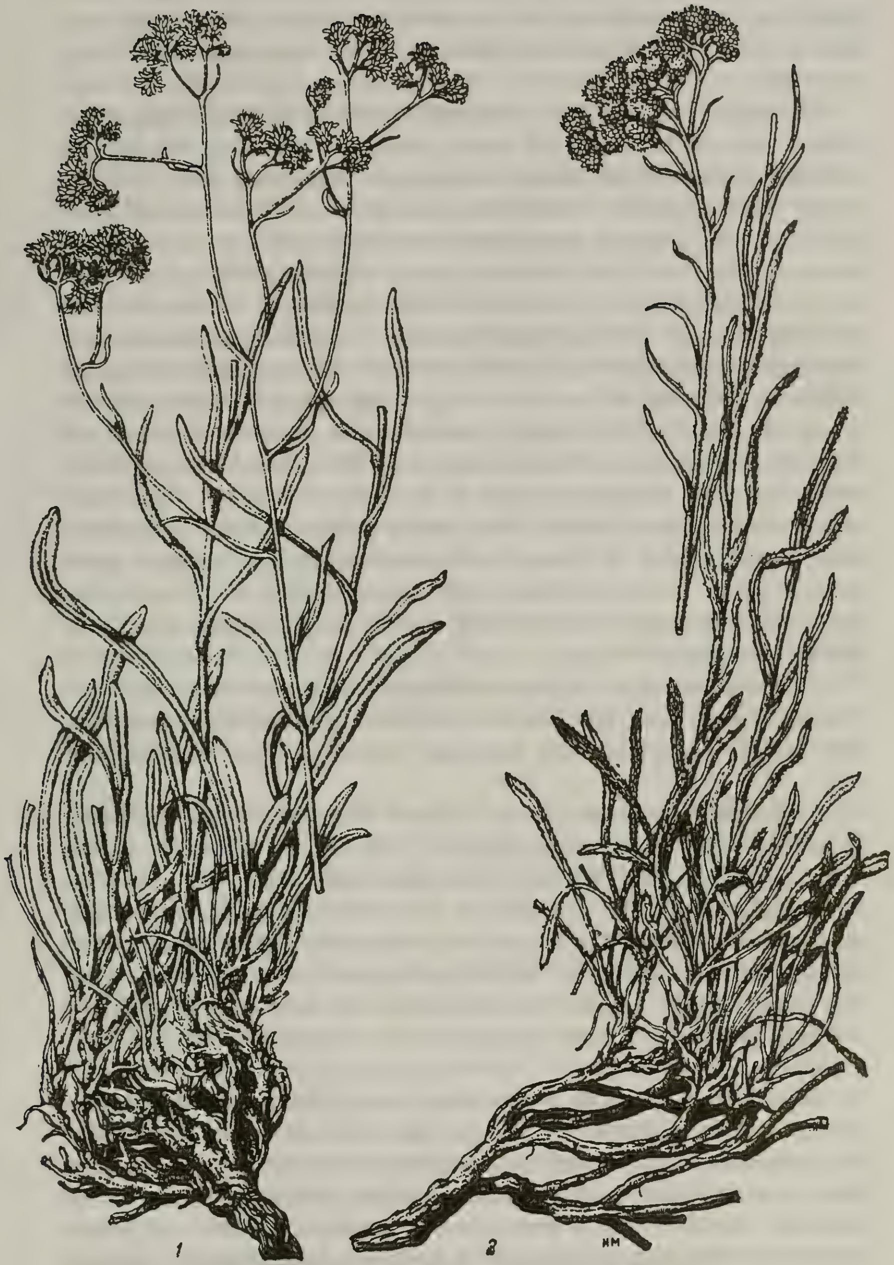
Economic Importance. It is an ornamental and medicinal plant (cholagogue). Besides, the resinous substance found in all parts of the plant contains the antibiotic arenarin, which suppresses bacteriosis in 412 cultivated plants; presowing treatment of seeds with arenarin promotes better germination, increased viability and other phenomena, resulting in increased yield potential (for more details see article by K.I. Bel'tyukova and E.Ya. Ryabova, *Poleznye svoistva bessmertnika* [Useful properties of everlastings], *Nauka i Zhinzn*', No. 2, 1958, pp. 45–46.

2. **H. undulatum** Ldb. Fl. Ross. II, 2 (1845–1846) 606; Kirp. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XX. —*H. pluriceps* C. Koch. in Linnaea XXIV (1851) 348. —*H. arenarium* β. *aurantiacum* DC. Prodr. VI (1837) 184, p. p. —*H. arenarium* β. *undulatum* C. Koch., and γ. *plinthocalyx* C. Koch op. cit., 352. —*H. lavandulaefolium* Willd. γ. *rubicundum* C. Koch. op. cit., 352. —*H. arenarium* var. *roseum* Trautv. in Tr. Peterb. Bot. Sada, I (1871) 23, p. p. —*H. arenaium* β. *stenophyllum* Boiss. Fl. or. III (1875) 235. —*H. plinthocalyx* (C. Koch) Sosn. in Grossh. and Schischk. Sched. ad. herb. Pl. or. exsicc., fasc. I–VIII (1924) 8; Grossh. Fl. Kavk. IV (1934) 104 and Opredel. Rast. Kavk. (1949) 446; Shkhiyan in Fl. Gruzii, VIII, 272. —*H. plinthocalyx* var. *aurantiacum* Sosn. in Grossh. op. cit. (1934), 104; Shkhiyan, l. c. —*H. rubicundum* (C. Koch.) Grossh. l. l. c.c. (1934) 104 and (1949) 446. —?*H. pluriceps* Grossh. non C. Koch in Grossh. l. l. c. c. (1934) 104 and (1949) 446. —*H. azerbajdzhanicum* Sosn. ex Grossh. op. cit. (1949) 446, absque diagn. —*H. sosnowskyi* Grossh. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XIII (1950) 27 (incl. f. *rubrum* Grossh.); Grossh. Opredel. Rast. Kavk., 446. —*H. sosnowskyi* f. *croceum* Grossh. in herb. —*Antennaria rubicunda* C. Koch in Linnaea, XVII (1843) 49; Ldb. op. cit. 613.

Perennial. Plant forming tussocks; root woody, fibrous, 3–7(12) mm thick, branched. Flowering stems few or many, (7)18–30(45) cm high, erect or ascending, tomentose. Leaves linear or linearly spatulate, sessile, often appressed to stem, grayish-green or gray from more or less dense tomentum, acute, with short brownish tip (not always distinct); at least some leaves almost always undulate along margin; sterile stems numerous, with linearly spatulate petiolate leaves. Capitula (6)10–25(50), almost spherical or cylindrical-cup-shaped, small, 4–6 mm wide, on short tomentose pubescent peduncles or more or less sessile, usually in compact or capitate corymb. Involucral bracts 35–60, lax, on back arachnoid-pubescent, often spreading, variously colored; sulfur-, pale, and straw-yellow to whitish or pinkish, pink, brick-red and orange; outermost bracts almost rotund, elliptical, or obovate, one-fourth to half as long as inner, oblong-spatulate or almost oblong bracts, slightly undulate along upper
415 margin. Florets 50–55; pappus of about 25 very fine, scarcely barbed, whitish hairs. Flowering VI–IX.

Clayey, stony, and rubbly slopes, often on gypsum, chalk, and saline soils to 2,000 m. *Caucasus*: Eastern Transcaucasia, southern Transcaucasia, Talysh. *General distribution*: Armenia and Kurdistan, Iran. Described from Talysh. Type in Leningrad.

Note. A highly polymorphic species requiring further study. Particularly important are observations in nature on variation in the color of the involucral bracts.



413

Plate XXV.
Habit of plant: 1—*Helichrysum thianschanicum* Rgl.; 2—*H. mussae* Nevski.

3. **H. kopetdagense** Kirp. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR XX. —*H. arenarium* var. *nodosum* O. Ktze. in Tr. Peterb. Bot. Sada X (1887) 203, p. p. —**Exs.**: Sintenis, It. transcasp.-pers. 1900–1901, No. 714.

Perennial. Tomentose or tomentose-flocculose plant, forming small tussock; root thick, up to 1 cm, woody, branched, producing few rosettes of sterile stems and few strong, woody, erect, flowering stems, (25)50–60 cm high, sometimes weakly branched above, with remains of dead leaves at base, growing leaves lanceolate-linear or linear, acute; upper leaves sessile, lower often petiolate; leaves of sterile stems linear-spatulate, or linear-lanceolate, petiolate, leaf base broadened; bulbous, dorsally often membranous and arachnoid-flocculose. Capitula broad obovate and almost globose to cylindrical, usually 5–6 mm wide, on densely tomentose pubescent peduncles of uncertain length, aggregated at stem apices in groups of (15)30–50 in compact or, less often, lax or somewhat compound corymbose inflorescence. Involucral bracts 35–50, sulfur-, lemon- or straw-yellow, or even whitish, lax, five- to seven-rowed, usually slightly recurved after flowering; outer bracts almost rotund or broadly elliptical, inner broad, oblong- or linear-spatulate, all bracts with distinct green stripe in center. Florets of about 25–30; pappus of about 25–30 yellowish, dirty white, or white, fine, scarcely barbed hairs, roughly as long as corolla. Flowering VII–VIII.

Mid-mountain zone, often in wheatgrass [*Agropyron*] associations. —*Soviet Central Asia*: mountainous Turkmenia. *General distibution*: Possibly in Iran. Described from Kopetdag Mountains. Type in Leningrad.

4. **H. thianschanicum** Rgl. in Tr. Peterb. Bot. Sada. VI, 2 (1880) 307; O. and B. Fedtsch. Perech. Rast. Turk. IV (1911) 207 (sub *H. tianschanico*). 416 Kirp. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XX. —*H. arenaricum* δ. *kokanicum* Rgl. and Schmalh. in Izv. Obshch. Lyubit. Estestvozn., antrop. i Etnogr. XXXIV, 2 (1882) 45, p. p. —*H. arenarium* var. *turkestanicum* Rgl. and Schmalh. ibid. CIII (1902) 84 (nomen nudum). —*H. tianschanicum* Rgl. var. *aureum* O. and B. Fedtsch. op. cit. —*H. kokanicum* Krasch. and Gontsch. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, IX, No. 4–12 (1946) 153.

Perennial. Root up to 1 cm thick, woody, fibrous, many-headed. Flowering stems (20)35–40(60) cm high, numerous or few, usually branched from middle (rarely simple); branches slender, 5–12 cm long, densely covered as also entire plant with fine, dense, white-grayish tomentum. Leaves of sterile stems linearly spatulate, broader and longer than linear-lanceolate, acute leaves of flowering stems. Capitula terminal on stem and branches, aggregated usually in clusters of three to six or more, narrow campanulate or obconical, 5–7 mm long and 4–6 mm wide, on peduncles almost as long as capitula or almost sessile. Involucral bracts about 30, somewhat lax, imbricate, six- or seven-rowed, in upper part more or less spreading, in lower half tomentose on the back; outermost bracts lanceolate, one-third to half as long as inner ones, linear-lanceolate or spatulate bracts, obtuse or truncate. Florets in capitulum about 25; pappus of about 40 very fine hairs. Flowering VI–IX. (Plate XXV, Fig. 1).

Stony and sandy places, gravel-beds and river terraces, dry slopes, at an altitude of several hundred to 3,000 m. —*Soviet Central Asia*: Pamiro-Alai. *General distribution*: Dzhungaria-Kashgaria. Described from Kuldzha. Type in Leningrad.

Note. While describing *H. kokanicum* Krasch. and Gontsch., S.M. Krascheninnikov separated f. *depauperata* H. Krasch. (l. c.) as well. In fact, in the herbaria we find specimens with a depauperate inflorescence that are relatively stunted and fewer branched or not branched at all (*H. thianschanicum* Rgl. f. *depauperatum* (Krasch.) Kirp. comb. nov.).

Since C. Winkler, who identified as *H. tianschanicum* not only this species but also plants typical of *H. maracandium* M. Pop., specimens expressly of the latter species from Soviet Central Asia most often, but totally incorrectly, have passed under the name *H. thianschanicum.*

Series 2. Mussaeana Kirp. —Involucral bracts sometimes whitish, usually pale- or brown-, straw-yellow or even brown-orange; capitula with fewer, about 20–30 florets; pappus of white or weakly light straw-colored hairs. Plants found in Soviet Central Asia at an altitude of 1,500–3,000 m.

417 5. **H. mussae** Nevski in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, 4 (1937) 279; Kirp. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XX. —*H. arenarium* δ. *kokanicum* Rgl. and Schmalh. in Izv. Obshch. Lyubit. Estestvozn., Antrop. i Etnorg. XXXIV, 2 (1882) 45, p. p. —*H. thianschanicum* Rgl. var. *mussae* and var. *stenophyllum* C. Winkl. p. p. in O. and B. Fedtsch. Perech. Rast. Turk. IV (1911) 207 (nomina nuda).

Perennial. Root woody, many-headed, 3–6(up to 10) mm thick, producing short sterile and usually numerous slender, simple, herbaceous, flowering stems (15)25–30(45) cm high, covered with thin, compact, white tomentum. Leaves grayish-green from thin arachnoid tomentum, linear-lanceolate or linear, usually gradually tapered from base to tip, obtuse, with distinct (under magnifying glass) brown tip. Capitula on slender, almost as long peduncles, cylindrical-campanulate or more often obconical, 5–6 mm long, terminal in groups of (3)7–12(rarely more) in more or less compound corymb. Involucral bracts about 30, brownish or brownish-straw-yellow or brownish-orange, rather lax, six- or seven-rowed, usually with a prominent transverse fold in upper part and somewhat spreading, on the back arachnoid pubescent; outermost bracts few, lanceolate or obovate, one-third to half as long as inner, broad or oblong-spatulate bracts, often slightly sinuate at apex. Florets in capitulum 25–30; pappus of about 25 almost transparent or light straw-yellow hairs, roughly as long as corolla. Flowering VII–VIII. (Plate XXV, Fig. 2).

Stony and herbaceous slopes, on rocks in juniper stands, often on outcrops and granite debris, at an altitude of 1,500–3,000 m. —*Soviet Cental Asia*: Pamiro-Alai. Described from the Kugitang Mountains. Type in Leningrad.

6. **H. nuratavicum** Krasch. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR IX, Nos. 4–12 (1946) 154; Kirp. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XX.

Perennial. Plant with sterile stems forming small but dense tussock; root woody, usually tap root, about 5 mm in diameter, usually short, many-headed, producing numerous sterile and few (mostly three to five) flowering stems (3)5–20(35) cm high, covered as also the entire plant with grayish arachnoid tomentum, sometimes mixed with few glandular hairs. Leaves revolute, linear, linear-lanceolate or linear-spatulate, usually 1.5–2.5 cm long and 1–2 mm wide. Capitula 2–6 (rarely more, some of them undeveloped), obconical or narrow campanulate, 4–6 mm long and 3–4 mm wide, usually on short, densely white tomentose peduncles, terminal in compressed, almost capitate corymbs. Involucral bracts about 40, brown-
418 ish-yellow or pale straw-yellow, even whitish, imbricate, five- to eight-rowed; bracts of outer two or three rows broad lanceolate, elliptical or ovate, very short (1–2 mm long), densely arachnoid pubescent; inner bracts linear-spatulate or linear, to 5–6 mm long, on the back tomentose. Florets in capitulum about 20; pappus of about 25 fine, white hairs, almost as long as corolla. Flowering VII–IX.

Stony slopes, in wormwood-grass thickets, at an altitude of 1,500–2,000 m. —*Soviet Central Asia*: Pamiro-Alai. Endemic. Described from the Nuratau Mountains. Type in Leningrad.

Note. A completely inadequately studied species. Especially important are observations that could help in resolving the question (so far not clear) of the relationship of *H. nuratavicum* to *H. mussae*.

Series 3. Plicata Kirp. —Involucral bracts more or less longitudinally plicate, sulfur-, lemon- or golden-yellow, rarely milky white; flowering stems usually somewhat sulcate, almost always glandular hairy as also leaves; compound inflorescence in young stage usually enclosed by few bracteal leaves. Plant mainly of subalpine and alpine zones.

7. **H. polyphyllum** Ldb. Fl. Ross. II, 2 (1845–1846) 605; Grossh. Opredel. Rast. Kavk., 445; Shkhiyan in Fl. Gruzii VIII, 268; Kirp. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR XX. —**Ic.**: Fl. Gruzii VIII, p. 269, Fig. 385 (fig. manca).

Perennial. Root woody, about 3–5 mm thick, usually not deep, producing strong, erect, flowering stems and rosettes of sterile shoots. Plant greenish, weakly arachnoid pubescent, with numerous glands on stems and leaves, particularly abundant in upper half; flowering stems solitary or few, (20)30(40) cm high, distinctly sulcate, densely leafy. Leaves 4–7 cm long and about 5(12–13) mm wide, linear or linear-lanceolate, sessile, semiamplexicaul, acute. Capitula 6–7 mm long and 5–6 mm wide, broad cylindrical to almost spherical, numerous (20–40), in compact, often compound, terminal corymb, usually with few compactly enclosing bracteal leaves. Involucral bracts 40–50, one- to five-rowed, sulfur- or lemon-yellow, somewhat depressed or plicate, from outer shorter, lanceolate, arachnoid bracts to inner linear-spatulate, slightly longer than florets. Florets 60–70; pappus of about 20 fine, barbed, straw-yellow hairs longer than corolla. Flowering VI–VIII.

419 Subalpine and alpine zones, on rubbly-stony slopes and in pastures. —*Caucasus*: Western Transcaucasia (Adzharia). Endemic. Described from Georgia. Type in Leningrad.

Note. It is possible that *H. polyphyllum* Ldb. hybridizes with *H. graveolens* (M.B.) Sweet.

8. **H. plicatum** (Fisch. and Mey.) DC. Prodr. VI (1837) 183; Ldb. Fl. Ross. II, 2, 606; Boiss. Fl. or. III, 231; Grossh. Fl. Kavk. IV (1934) 103 and Opredel. Rast. Kavk. 445; Shkhiyan in Fl. Gruzii, VIII, 268; Kirp. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XX. —*H. anatolicum* Boiss. Diagn. ser. 1, IV (1844) 11. —*H. plicatum* DC. β. *lacteum* Boiss. Fl. or. III (1875) 231; Grossh. op. cit. (1934) 103 (var. *lacteum* Boiss.). —*H. plicatum* var. *citrinum* Trautv. (in herb.?); Grossh. op. cit. (1934) 103. —*H. plicatum* var. *eglandulosum* Medw. in Tr. Tifl. Bot. Sada, XVIII, 2 (1918) [1919] 253; Grossh. op. cit. (1934) 102. —*Gnaphalium plicatum* Fisch. and Mey. apud Hohenacker in Bull. Soc. Nat. Mosc. XI, 3 (1838) 287 (separatim editum, p. 57). —**Ic.**: Gartenfl. XXVI, tab. 889, fig. 2 (icon admodum mediocris). —**Exs.**: Aucher-Eloy, Herb. d'Or. No. 4784; Kotschy, Pl. Pers. bor. Nos. 319, 322, 378; Bourgeau, Pl. Armen. No. 151; Sintenis, It. or. 1892, No. 4588 and It. or. 1894, No. 6189; Bornm. It. syr. 1897, No. 849; Pl. or. exs. No. 71 and No. 273 (var. *lacteum* Boiss.).

Perennial. Plant forming loose mat; root 2–5 mm thick, woody, producing numerous branches terminating in few flowering stems and usually considerable number of sterile stems, distinctly bulbous at base. Flowering stems (10)20–30(55) cm high, erect or ascending, weakly sulcate, often reddish, glandular or even (rarely!) arachnoid-hairy-tomentose, and then glands usually not visible (var. *eglandulosum* Medw.). Leaves linear or linear-lanceolate, semiamplexicaul, acute, greenish, often falcate or irregularly curved, with more or less considerable number of glands or even greenish-gray tomentose pubescence, and then glands scarcely visible (var. *eglandulosum* Medw.); leaves of sterile stems linearly lanceolate or linear-spatulate, usually more densely pubescent. Young capitula ellipsoid, in compact heads, sometimes surrounded by a few bracteal leaves; mature capitula hemispherical or subspherical, about 7–8 mm wide, on slender, glabrous or tomentose peduncles, usually longer than capitula; compound corymb lax, consisting of (8)25–40(60) capitula. Involucral bracts 35–50, four- to six-rowed, golden-yellow or milky-white (var. *lacteum* Boiss.), on back slightly arachnoid-hairy, from outer lanceolate and broad oblong-spatulate to inner oblong-spatulate or sublinear; outermost bracts (few) half as long as 420 others, carinate. Florets 35–50(80); pappus of 20–25 hairs, slightly yellowish, weakly barbed, more or less as long as corolla. Flowering VI–VIII.

Edges of montane open woods, dry montane-steppe and stony slopes of subalpine and alpine zones, often on calcareous soils, at 1,300–2,600 m. —*Caucasus*: Eastern Transcaucasia, southern Transcaucasia. *General distribution*: Balkans-Asia Minor, Armenia and Kurdistan, Iran. Described from Szovits's collections from Koshadar along the Nakhichevan-Chai River. Type in Leningrad.

9. **H. maracandicum** M. Pop. ex Kirp. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XX; M. Pop. in Tr. Uzbek. Gos. Univ., Nov. Ser., No. 27, Biol., No. 14 (1941) 63 (descr. brev. ross.). —*H. anatolicum* var. *elatius* Herd. ("*elatior*") in Bull. Soc. Nat. Mosc. XL (1867) 134. —*H. plicatum* auct. Fl. turkest. non DC.: O. and B. Fedtsch. Perech. Rast. Turk. IV (1911) 207; Lapin, Opredel. Rast. Tashkent. Oazisa I (1938) 290. —*H. thianschanicum* auct. Fl. turkest. p. p. non Rgl.: O. and B. Fedtsch., op. cit.

Perennial. Root woody, many-headed or short-many-headed, producing few (two to four) or more (six to ten) flowering stems, at base usually thickened from compactly surrounding living or dead leaves. Sterile stems usually few, with linear-lanceolate or linear-spatulate, petiolate leaves, rather abruptly transitional to triangular broadened base, forming prominent flocculose- or arachnoid-tomentose, bulbous thickening; base of lower leaves with prominent veins, often membranous and red; flowering stems (12)25–40(75) cm high, with linear or linear-lanceolate leaves, acuminate or cuspidate, sometimes falcate or irregularly curved, or straight and obliquely upright, semiamplexicaul, basally with triangular notch, usually with prominent midrib beneath, greenish, grayish-green or yellow-brown, more often, more or less densely tomentose or flocculose, sometimes (particularly in sparsely hairy leaves) mixed with glandular hairs, in rare cases leaves densely lead-gray pubescent. Flowering stems weakly sulcate, woody, greenish or yellowish-brown, strongly or weakly arachnoid or flocculose, usually distinctly mixed with glandular hairs, or stems (in mature plants!) brownish, with more dense glandular hairs, often almost leafless or with brown remains of withered leaves; sometimes flowering stems as also entire plant densely arachnoid-tomentose. Capitula hemispherical, spherical, campanulate or ellipsoid on densely tomentose (sometimes mixed with glandular hairs) peduncles, usually longer 421 than or as long as capitulum (rarely peduncles not as long as capitula); young inflorescence often almost capitate and usually surrounded by a few bracteal leaves, more or less compact corymbose when mature, consisting of (6)15–50 (rarely 100 and even more) capitula. Involucral bracts 50–60, lemon-yellow, more or less distinctly plicate, usually five-rowed, dorsally pubescent; outer bracts lanceolate, broad lanceolate, or elliptical, inner bracts more numerous, broad or oblong-spatulate; involucre usually spreading after fruiting or sometimes even cup-shaped. Florets about 60–75; pappus of 20–25 very fine, weakly barbed hairs almost as long as corolla (or slightly shorter), somewhat yellowish or whitish below, yellowish above. Flowering (V)VI–IX(X).

In phytocenoses of mixed herbaceous, wheatgrass, sheep's fescue, and wormwood steppes, open juniper woodlands, thickets of woody scrub zone, dry stony and clay slopes and rubble talus, from 600 to 2,500 m. —*Soviet Central Asia:* Pamiro-Alai, Tien Shan. Described from the Samarkand Mountains (Aman-Kutan). Type in Leningrad.

Note. Apparently, *H. maracandicum* M. Pop. ex Kirp. hybridizes with *H. mussae* Nevski and *thianschanicum* Rgl: Apart from this, *H. maracandicum* varies greatly and, one can hypothesize, is at the stage of differentiating into separate races. The following markedly differ from the type: (1) South Tadzhikistan plants growing south of Stalinabad and characterized by comparatively larger and more numerous capitula aggregated in a capitate corymb; (2) a number of specimens from the regions of the Susamyr and West Karakol rivers with dense lead-gray pubescence on the leaves; (3) specimens collected from Namangan Province and distinguished by dense arachnoid tomentum over the entire plant, relatively thick, densely white tomentose peduncles, well developed tap root, compact mat, and other peculiarities.

10. **H. graveolens** (M.B.) Sweet, Hort. Brit. ed. 1 (1827) 223; Kirp. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XX. —*H. graveolens* (M.B.)

DC. Prodr. VI (1837) 184; Ldb. Fl. Ross. II, 2, 607; Boiss. Fl. or. III, 232 (saltem p. maxim p.); Fedtsch. and Fler. Fl. Evrop. Ross. 960; Grossh. Fl. Kavk. IV (1934) 103 and Opredel. Rast. Kavk. 445; Shkhiyan in Fl. Gruzii, VIII, 271. —*Gnaphalium graveolens* M.B. Fl. taur.-cauc. II (1808) 299 and III (1819) 567, No. 1703; Schmalh. Fl. II, 47. —**Ic.**: Gartenfl. XXVI, tab. 889, fig. 1 (icon mediocris). —**Exs.**: GRF Nos. 420, 3948; Th. Pichler, Pl. exs. fl. rum. et bith., No. 13 (sub Hel. lanato DC.); Sintenis, It. or. 1892, No. 4473; ej. It. or. 1894, No. 7171.

Perennial. Plant forming loose tussock; root not thick, usually 2–3(5) 422 mm thick, woody, brown creeping, strongly branched, producing numerous branches ending in erect, (7)15–20(35) cm high, flowering stems and short sterile stems; bases of flowering and sterile stems covered with remains of dead dark brown leaves. Entire plant grayish-green, gray or whitish-gray, lanate (often shaggy or flocculose). Leaves of sterile stems oblong-spatulate, obtuse or subacute, gradually narrowed to base, usually 3–5 cm long and 4–7 mm wide; cauline leaves shorter, linear or linear-lanceolate, acute, upper often spinulose. Capitula medium, campanulate or more or less spherical, numerous, on short peduncles or subsessile, usually in compact capitate corymbs (rarely corymb lax and umbellate), with densely lanate peduncles; corymbs often tightly surrounded by bracteal leaves and together with them usually densely arachnoid-tomentose on one side (sometimes almost up to tip of corymb); bracteal leaves in young specimens tightly enclosing corymb and longer than it. Involucral bracts about 40, lemon- or sulfur-lemon-yellow lustrous, slightly and unequally longitudinally plicate, lax, four- or five-rowed; outer bracts arachnoid on the back, obovate, shorter than inner broad, oblong-spatulate bracts. Florets somewhat exserted from involucre, 50–65 in capitulum, their staminal tube distinctly exserted from corolla in disk florets; pappus of about 20 pale yellow, very fine, weakly barbed hairs, roughly as long as corolla. Flowering VI–VIII.

High pastures (Crimea), subalpine and alpine (lower belt) meadows, dry slopes, often on calcareous soils and along dry stony beds of mountain streams. —*European Part:* Crimea; *Caucasus:* Western Transcaucasia, eastern Transcaucasia, southern Transcaucasia. *General distribution*: Balkans-Asia Minor? Armenia and Kurdistan. Described from the Chatyrdag Mountains in the Crimea. Type in Leningrad.

Note. The hybrid spcies *H. buschii* Juz. (*H. arenarium* × *H. graveolens*) is described in the critical note on *H. graveolens* (*Spisok Rastenii Gerbariya Flory SSSR,* Vol. XIII, 1955, p. 97) published by S.V. Juzepczuk. The taxonomic significance of *H. buschii* remains uncertain, awaiting more detailed study of the *H. arenarium* (L.) Moench. s. l. complex.

Series 4. Araxina Kirp. —Involucral bracts sulfur-lemon or pale-yellow, rarely yellow-green or whitish, sometimes milky-white. Flowering stems as well as leaves usually glandular-hairy, often densely, sometimes indistinctly. Plants of subalpine and alpine zones, with stout, woody, many-headed root.

11. **H. armenium** (Fisch. and Mey.) DC. Prodr. VI (1837) 183; Ldb. Fl. Ross. II, 2, 605; Boiss. Fl. or. III, 235; Grossh. Fl. Kavk. IV (1934) 423 104 and Opredel. Rast. Kavk. 445 (sphalm. *H. armeniacum* DC.); Kirp. in Bot. Mat. Gerb. Bot. Inst. XX. —? *H. glanduliferum* Schultz Bip. in Bot. Zeitschr. (1845) 173. —*H. glandulosum* Ldb. op. cit. 605; Grossh. op. cit. (1934) 103. —*H. tardentii* Boiss. Diagn. pl. or. nov. ser. 1, XI (1849) 29. —*H. armenium* β. *lacteum* Boiss. op. cit. 236; Grossh. op. cit. (1934) 104 (var. *lacteum* Boiss.). — *H. arenarium* var. *armenium* O. Ktze. Tr. Peterb. Bot. Sada, X (1887) 203. —*Gnaphalium armenium* Fisch. and Mey. ex DC. op. cit. —**Exs.**: Aucher-Eloy, Herb. d'Or. No. 3114; Kotschy, It. cilic.-kurd. 1859, No. 342; Sintenis, It. or. 1890, Nos. 2727, 2804, 2805.

Perennial. Root thick, to 10–12 mm woody, fibrous, deep, strongly branched in upper part, producing considerable number of short sterile and flowering stems, at base usually covered with remains of previous year's leaves. Flowering stems erect, simple, (20)25–30(35) cm high, basally woody, below inflorescence densely gray tomentose, considerably sparsely arachnoid-lanate or flocculose to almost glabrous below and usually, as also cauline leaves, covered with glandular hairs. Leaves of sterile stems linearly spatulate with lamina narrowed into petiole; leaves of flowering stems usually shorter, linear or lanceolate-linear, acuminate, gradually reduced upward, more often pubescent along margin and midrib, in the remaining part glabrous and subglabrous. Capitula subspherical, broad cylindrical or spherical obconical, usually 7 mm long and 6–9 mm wide, in groups of (5–7)10–25 (sometimes up to 70) in terminal corymb. Involucral bracts about 40–50, sulfur- or lemon-yellow, or yellowish-green, sometimes milky-white (var. *lacteum* Boiss.), rather lustrous, six- or seven-rowed, on the outside arachnoid; outermost bracts elliptical, few, roughly half as long as inner oblong-spatulate bracts. Florets in capitulum 20–30; pappus of 20–25 fine, yellowish, barbed hairs, roughly as long as corolla. Flowering VI–VIII.

Dry rocky places of subalpine and alpine zones. —*Caucasus*: Western Transcaucasia (Svanetia), eastern Transcaucasia, southern Transcaucasia. *General distribution*: Armenia and Kurdistan, Iran. Described from northern Iran and Nakhichevan. Type in Leningrad.

Note. H. armenium (Fisch. and Mey.) DC. is a polymorphic species requiring further critical study. On the basis of the degree of abundance of the glandular hairs, three forms can be recognized (f. *glandulosum* Kirp., f. *subglandulosum* Kirp. and f. *eglandulosum* Kirp. in *Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR*, XX). These forms, apparently without taxonomic significance, are interesting because similar ones appear also in other species of the series *Armenia* and *Plicata*. A similar recurrence pertains also to forms with milky-white involucral bracts that are constantly being found in the species of these series.

424 12. **H. araxinum** Takht. ex Kirp. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR XX; Takht. in Grossh. Opredel. Rast. Kavk. (1949) 446 (descr. brev. ross.).

Perennial. Root woody, up to 1 cm thick, many-headed, producing numerous flowering stems; sterile stems variable in number, often many, with grayish-green or almost white tomentose, linear-lanceolate or narrow spatulate, petiolate leaves, acuminate or with more or less distinct brownish cusp. Flowering stems 30–40 cm high, white tomentose pubescent, with sessile, linear or linear-lanceolate leaves, usually grayish-green tomentose, usually mixed with glandular hairs, acuminate or cuspidate. Capitula smaller, usually 2–3(4) mm wide and about 5 mm long, spherical-obconical, ellipsoid or cup-shaped, on variously long but more often short peduncles, in lax, sometimes compound corymbs of few or 10–20 capitula. Involucral bracts about 45, pale yellow or whitish with green stripe, dorsally arachnoid pubescent, somewhat lax imbricate, six- or seven-rowed; outermost bracts almost elliptical and one-third to half as long as other, oblong or oblong-spatulate bracts. Florets 25–30; pappus of about 25 hyaline (white), finely barbed hairs, slightly longer than corolla and more firmly attached to achene. Flowering VI–VIII.

Stony slopes and rocks, basalts. —*Caucasus*: Southern Transcaucasia, Talysh(?). Described from Nakhichevan ASSR. Type in Leningrad.

Note. This description is based on a few specimens collected in Nakhichevan ASSR. This species is close to *H. armenium* (F. and M.) DC. and requires further study.

Series 5. Callichrysa Kirp. —Involucral bracts usually numerous, quite often somewhat longitudinally plicate, usually lustrous, bright golden or orange, less often lemon-yellow. Capitula, as a rule, larger, often more than 10 mm wide. Dwarf lanate plants or subalpine and alpine zones, forming beds or tussocks.

13. **H. callichrysum** (Fisch. and Mey.) DC. Prodr. VI (1837) 183; Kirp. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XX. —*Gnaphalium callichrysum* Fisch. and Mey. ex DC. l. c. —*H. pallasii* Ldb. Fl. Ross. II, 2 (1845–1846) 606, p. p. non *Gnaphalium pallasii* Spreng. Syst.

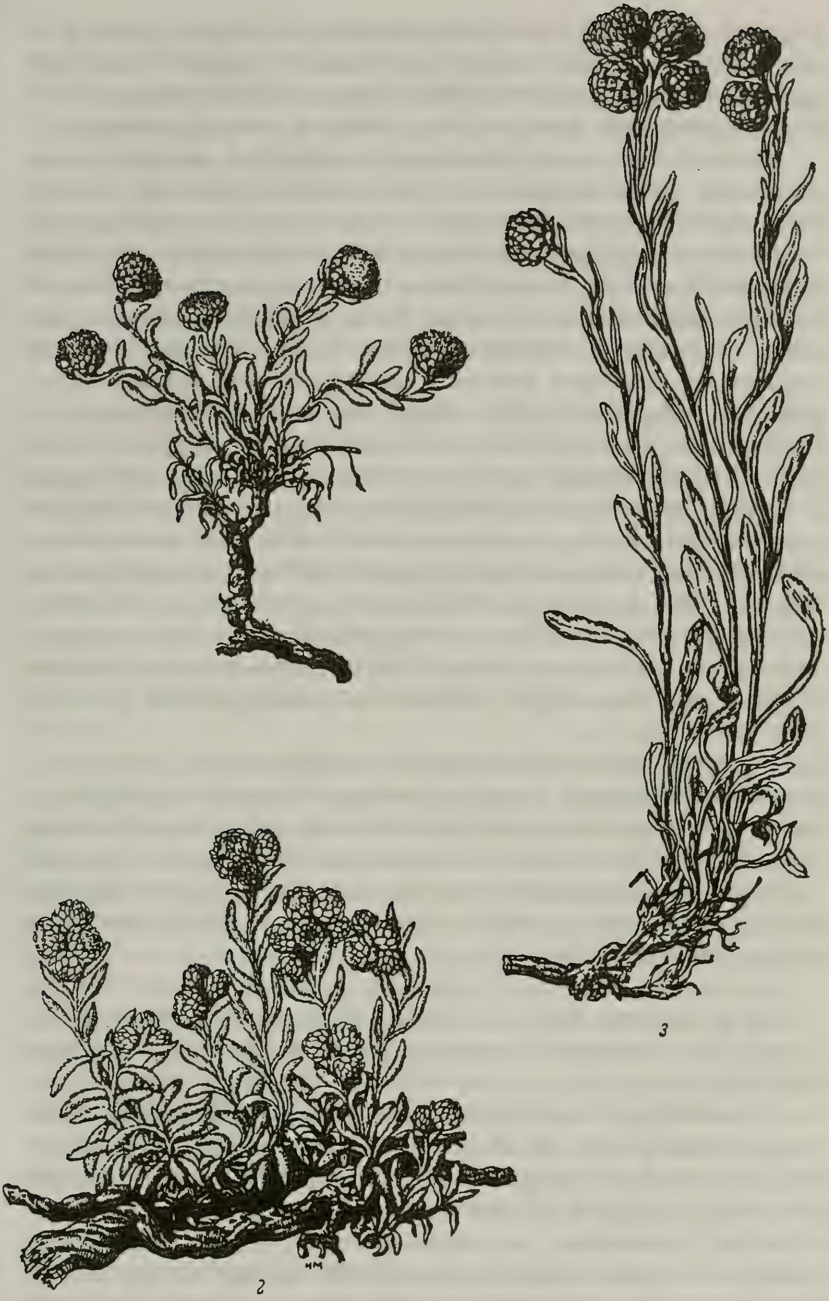


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Plate XXVI.

Habit of plant. 1, 2—*Helichrysum pallasii* (Spreng.) Ldb.; 3—*H. callichrysum* (Fisch. and Mey.) DC.

427 Veget. III (1826) 470. —*H. pallasii* Boiss. Fl. or. III (1875) 230, p. p. non *Gnaphalium pallasii* Spreng. l. c.; Grossh. Fl. Kavk. IV (1934) 102 and Opredel. Rast. Kavk. 445. —**Exs.**: Sintenis, It. or. 1890, No. 3257 (forma haud prorsus typica ob folia planiora et minus pubescentia).

Perennial. Root woody many-headed, slender (3–5 mm thick). Flowering stems solitary or often few (7)15–20(25) cm high, erect, forming loose tussock together with rosettes of sterile stems. Leaves of flowering stems 3–5 cm long (uppermost shorter), linear to linear-lanceolate, acuminate, usually strongly involute, falcate or irregularly curved, arachnoid-tomentose pubescent as also stem; leaves of sterile stems somewhat longer and broader, with prominent midrib, slightly involute. Capitula on long, densely tomentose peduncles, often with small reduced leaves, globose or flat-globose, (12e)15–18(20) mm wide, terminal, solitary or more often in groups of two or three (rarely more). Involucral bracts about 80, golden lustrous, more or less conspicuously longitudinally plicate (sometimes longitudinally goffered), along margin somewhat toothed or somewhat fimbriate, lax, six- or seven-rowed, on the back sparsely arachnoid pubescent; outermost bracts lanceolate or elliptical, roughly half as long as others; inner bracts about 7 mm long, elliptical to lanceolate, inner-most bracts spatulate or oblong-spatulate. Florets 60–70 (sometimes up to 100); pappus of about 25–30 fine, sharply barbed yellowish or light brown hairs, slightly longer than corolla. Flowering VII–VIII. (Plate XXVI, Fig. 3).

Dry stony slopes in upper montane and alpine zones. —*Caucasus:* Southern Transcaucasia. *General distribution:* Armenia and Kurdistan, Iran(?). Described from Szovits's collections from Daralagyoz (now territory of Mikoyanovsk Region of the Armenian SSR). Type in Leningrad.

Note. Since Ledebour, who considered *H. callichrysum* the same as his *H. pallasii,* many authors have confused these species, although in fact they are quite distinct.

14. **H. polylepis** Bordz. ex Grossh. Fl. Kavk. IV (1934) 102 and Opredel. Rast. Kavk. 445; Kirp. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XX.

Perennial. Root woody, many-headed, producing numerous, erect, mainly flowering stems, 15–25 cm high. Leaves linear, usually numerous, canescent from appressed tomentum as also entire plant. Capitula terminal, few, (6)8–10(13) mm wide and (7)8–9(11) mm long, broad cylindrical, campanulate, or truncate-obconical, usually on peduncles
428 longer than capitula. Involucral bracts 60–70, golden lustrous, usually broad spatulate, in lower half arachnoid pubescent on back, more compact, six- or seven-rowed, and distinctly longer than disk. Florets 70–80; pappus of about 25 hairs, distinctly (by one-third or one-fourth) longer

than corolla, in upper part narrowly tufted, with very sharp processes of the hair cells below. Flowering VII–VIII.

Dry stony places in upper montane zone. —*Caucasus:* Southern Transcaucasia. *General distribution:* Armenia and Kurdistan. Type not known; lectotype in Leningrad.

Note. H. polylepis Bordz. is not a very distinct species. It does not differ greatly from *H. callichrysum* (Fisch. and Mey.). Materials in the herbarium of the Botanical Institute (BIN) of the USSR Academy of Sciences also do not permit one to establish with certainty the relationship of *H. polylepsis* Bordz. to *H. aucheri* Boiss. and *H. chionophilum* Boiss. and Bal., to which, in any case, it is quite close.

15. **H. pallasii** (Spreng.) Ldb. Fl. Ross. II, 2 (1845–1846) 606, p. p.; Kirp. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XX. —*H. psychrophilum* Boiss. Diagn., nov. ser. 1, XI (1849) 28; Grossh. Opredel. Rast. Kavk. 445. —*H. pallasii* (Spreng.) Boiss. Fl. or. III (1875) 230. —*H. pallasii* γ. *psychrophilum* Boiss. ibid. 231. —*Gnaphalium uniflorum* Hablizl in Pall. Neue Nord. Beytr. IV (1783) 55 and in S.G. Gmel. Reise durch Russl. IV (1784) 176 non Mill. (1768). —*G. pallasii* Spreng. Syst. veget. III (1826) 470. —*G. uniflorum* Pall. in herb. and *G. monanthon* Willd. ex Spreng. ibid. pro synon. —**Exs.**: Aucher-Eloy, Herb. d'Or. No. 4788; Kotschy. Pl. Pers. bor. 1846, Nos. 463, 628; Buhse, Nos. 580, 586, 835; Bornm. It. pers. alt. 1902, No. 7471.

Perennial. Dwarf, creeping, lead-gray pubescent plant, forming more or less dense mat or cushion; root thick (up to 15 mm), woody, many-headed. Flowering stems more or less numerous, herbaceous, erect or ascending (2)5–12(15) cm high, with linear-lanceolate, acuminate leaves; leaves of sterile stems linear- or narrow spatulate, long-petiolate. Capitula terminal, almost spherical, solitary, large, 10–12 mm, or smaller, about 7 mm wide, semiglobose or campanulate, sessile or on short peduncles, compactly aggregated in groups of three to five (rarely up to 7–8). Involucral bracts up to 75, more often 40–60, five- or six-rowed, yellow or orange, often lustrous, longitudinally weakly plicate (in sicco!), usually somewhat toothed; outermost bracts acuminate-elliptical, one-eighth to half as long as inner lanceolate, broadly campanulate and linear-spatulate bracts. Florets 100–110, usually 50–60, often slightly exserted from involucre; pappus of 20–25 finely barbed, yellowish hairs, more or less as long as corolla. Flowering VI–VIII. (Plate XXVI, Figs. 1, 2).

429 Alpine zone, on rocks and stony talus. —*Caucasus:* Southern Transcaucasia. *General distribution:* Armenia and Kurdistan, Iran. Described from Iran. Type in Berlin; isotype in Leningrad.

Note. The species *H. pallasii* (Spreng.) Ldb. was poorly described by Sprengel, which is why it has been merged incorrectly with *H. callichrysum* (Fisch. and Mey.) DC. by some authors.

H. pallasii varies so much that it is difficult to refer specimens with relatively large, solitary capitula to the same species as also the forms with smaller capitula aggregated in groups of 3–5 (sometimes even more) at the tips of the stems. All the same, the presence of a whole series of transitional forms compels us to treat *H. pallasii* quite broadly. Observations in the field on the type of growth, color of the involucral bracts, size of the capitula, and other variable characters of *H. pallasii* are greatly desired; also greatly desired is information on the biology of this species.

Economic Importance. Beds of *H. pallasii* (Spreng.) Ldb. are extremely decorative and deserve trials for introducing the species into cultivation in alpine nurseries.

16. **H. aurantiacum** Boiss. and Huet ex Boiss. Diagn. nov. ser. 2, VI (1859) 105; Kirp. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XX. — *H. lavandulaefolium* D. Don in Transact. Wern. Nat. Hist. Soc. V, 2 (1826) 550 [non *Elichrysum lavandulaefolium* H.B.K. in Nov. Gen. et Sp. IV (1820) 68]. —*H. lavandulaefolium* DC. non Kunth in Prodr. VI (1837) 184. —*H. lavandulaefolium* Boiss. Fl. or. III (1875) 232. —*H. lavandulaefolium* auct. non DC. nec Boiss.: Trautv. in Tr. Peterb. Bot. Sada VIII, 2 (1883) 467 (Increm. fl. Ross. II, No. 2850); Grossh. Fl. Kavk. IV (1934) 103 and Opredel. Rast. Kavk. 445. —*Gnaphalium lavandulaefolium* Willd. Sp. pl. III, 3 (1800) 1868. —**Exs.**: Kotschy, It. cilic.-kurd. 1859, No. 493.

Perennial. Dwarf plant forming small tussock; root woody, 3–5 mm thick, in upper part short, many-headed; usually producing a few (more often two or three, rarely to 12), herbaceous, erect, (4)7–12(18) cm high flowering stems and usually many sterile stems; entire plant gray- or grayish-green from appressed tomentum. Leaves usually acute with distinct brownish tip; cauline leaves linear or linear-lanceolate, semiamplexicaul; leaves of sterile stems linear-spatulate or linear-lanceolate, petiolate. Capitula hemispherical or spherical-cylindrical, on tomentose peduncles almost as long as capitula or somewhat shorter; inflorescence terminal, compact, capitate corymb consisting of (5)8–15(20) capitula. Involucre slightly longer than floret; involucral bracts 35–50, orange or golden orange, four- or five-rowed, lanceolate to oblong-spatulate or almost oblong; outermost bracts (few) one-third to half as long as inner bracts. Florets about 35–45; pappus hairs about 20, finely barbed, yellowish, slightly longer-corolla. Flowering VII–VIII.

430 Stony mountain slopes in alpine zone, at 2,500–3,500 m. —*Caucasus*: Southern Transcaucasia. *General distribution*: Armenia and Kurdistan. Described from Turkey. Type in Geneva.

At different times, various authors, having studied the flora of Russia and USSR, have described also the following species of the genus *Helichrysum: H. angustifolium* DC., *H. buhseanum* Boiss.; *H. citrinum* Boiss., *H. commixtum* C. Koch., *H. compactum* Boiss., *H. lanatum* DC., *H. orientale* Gaertn., and *H. tchabanicum* C. Koch. These names are omitted from the present treatment. The reasons for this are set forth by us in articles published in the *Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR*, Vol. XIX, 1958, p. 356 and Vol. XX.

GENUS 1494. **Cladochaeta** DC.[1, 2]

DC. Prodr. VI (1837) 245

Capitula almost cylindrical, clustered in corymbose-paniculate inflorescences; involucral bracts imbricate, four- or five-rowed, appressed, membranous, outer bracts pubescent, obtuse; receptacle glabrous, flat, short scarious-setaceous; all florets bisexual, tubular, five-fid, yellow, longer than involucre; stamens with filiform appendages, almost as long as, longer, or shorter than corolla; style filiform, basally swollen; stigma with two coiled, smooth, long lobes; ovary in upper part somewhat narrowed, in middle swollen. Pappus one-rowed, densely plumose, slightly longer than corolla; pappus hairs clustered around narrowed part of ovary in tufts, fragile. Achenes cylindrical, narrowed to base, scabrous, terete. Perennial herbs with alternate leaves. Endemic Caucasian genus of two species.

1. Stem erect; leaves lanceolate or oblong-lanceolate, 2–5 cm long, the uppermost linear; inflorescence broad, paniculate-corymbose; capitula about (8)–10 mm long; florets 7–8 mm long..1. **C. candidissima** (M.B.) DC.

+ Stem more or less creeping, branched from base; entire plant densely tomentose; leaves shorter, 1.0–1.5 cm long, oblong, almost succulent, appressed, densely tomentose; inflorescence usually compact, mainly capitate-corymbose; capitulum about 6 mm long; floret about 5 mm long..................2. **C. caspica** Sosn.

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[1] Treatment by A.G. Borissova.

[2] From the Greek words *clados*—branch, and *chaete*—mane, bristles (so named for the strong pubescence of the plant).

431 1. **C. candidissima** (M.B.) DC. Prodr. VI (1837) 245; Ldb. Fl. Ross. II, 615; Boiss. Fl. or. III, 228; Grossh. Fl. Kavk. IV, 104; Grossh. Opredel. Rast. Kavk. 446. —*Gnaphalium candidissimum* M.B. Casp. (1800) 200; Fl. taur.-cauc. II (1808) 299, non Lam.; Schmalh. Fl. II, 47. —*Helichrysum candidissimum* Benth. and Hook. Gen. pl. II (1873–1876) 311. —**Exs.**: GRF No. 113 (sub *Helichrysum candidissimum* Benth. and Hook.).

Perennial. Roots slender, numerous; entire plant snow-white-tomentose. Stem basally woody, erect or somewhat ascending, 10–40 cm high, simple or branched. Leaves sessile, alternate, usually lanceolate, less often oblong-lanceolate, 2–5 cm long, obtuse, entire, without distinct veins; leaves in upper part linear or linear-lanceolate. Inflorescence terminal, dense, corymbose or paniculate-corymbose, leafless, with 15–20 capitula; capitula cylindrial, about (8)10 mm long, on short peduncles. Outer involucral bracts ovate to oblong, obtuse, yellowish, along margin membranous and lustrous, on back white-tomentose; inner bracts oblong-lanceolate, acute, broad, membranous; involucre of unopened capitula at tip reddish (crimson). Receptacle glabrous, flat, very short and scarious, setaceous. All florets dry, brownish, bisexual, filiform-tubular, 7–8 mm long, at tip infundibuliform, up to 1 mm wide, with five recurved, broad, triangular teeth; style shorter or as long as corolla; stigma with two coiled branches; stamens slightly longer or as long as corolla. Pappus very densely plumose, almost as long as corolla; achenes glabrous, about 1 mm long, oblong, weakly ribbed, scabrous. Flowering VI–VIII. (Plate XXI, Fig. 1).

Coastal sands, rubbly places, dry stream beds, up to mid-montane zone and in plains. —*Caucasus*: Ciscaucasia, Dagestan, eastern and southern Transcaucasia, Talysh. Endemic. Described from the Caucasus. Type in Leningrad.

Note. According to Ruprecht, it is an aromatic plant.

2. **C. caspica** Sosn. ex Grossh. Fl. Kavk. IV (1934) 105; Grossh. Opredel. 446.

Perennial. Rhizome branched, creeping, woody; roots filiform, numerous. Plant snow-white tomentose, lustrous when tomentum is removed. Stem almost creeping or ascending, densely leafy, 10–35 cm long, branched from base. Leaves thick, almost succulent, short, 1.0–1.5 cm long, obtuse, with short cusp; lower leaves oblong-spatulate, middle ones oblong-linear, upper ones linear. Inflorescence compact, capitate-corymbose; capitula about 6 mm long, slightly shorter and narrower than in previous species. Involucral bracts narrower and less obtuse than in previous species, whitish lanate, along margin membranous, lustrous, golden yellow; outer bracts rotund-ovate, inner ones oblong. Florets yellow, about 5 mm long; achenes covered with small, hyaline, bulged scales; pappus equaling involucre. Flowering VI–VIII.

432 Marine coastal sands and rubble beds, plains and valleys of mountain streams; forming thickets. —*Caucasus*: Eastern Transcaucasia (Kuba District of Azerbaidzhan SSR, Dzharat). Endemic. Described from Azerbaidzhan. Type in Tbilisi.

Note. C. caspica Sosn. is very close to *C. candidissima* (M.B.) DC. and apparently is only an ecological form.

Subtribe 5. **INULINAE** O. Hoffm. in Pflanzenfam. IV, 5 (1889–1894) 201. —Subtrib. *Euinuleae* Benth. in Benth. and Hook. f. Gen. Pl. II (1873) 187. —Capitula heterogamous; peripheral florets ligulate, inner tubular, or all florets in capitulum tubular; anthers usually with tail-like or arrow-like appendages at base. Receptacle without scales, often alveolate and more or less ciliate along edges of alveolate, or receptacle with scaly bristles.

GENUS 1495. **Codonocephalum** Fenzl.[1, 2]

Fenzl. XXVI, 1 (1843) 397. —Sprunnera Schultz Bip. in Walpers' Rep. II (1843) 954

Capitula campanulate, in lax corymbose inflorescence involucre many-rowed, imbricate; receptacle concave, alveolate, ciliate along edges of alveolae. All florets tubular, bisexual, yellow. Anthers with two tail-like appendages at base, covered with scattered, spreading bristles along margin. Style branches (stylodes) elongate, broadened above, acute, ciliate coiled. All achenes cylindrical, 4–5-angular; pappus uniseriate, of numerous bristles, at base slightly connate. Plants perennial; leaves alternate, entire; upper and middle leaves amplexicaul, sessile, lower petiolate.

Two species distributed in Kurdistan, northern Iran, and the southern part of Soviet Central Asia belong to this genus.

1. **C. paecockianum** Aitch. and Hemsl. in Trans. Linn. Soc., ser. II, III (1886) 75; O. and B. Fedtsch. Perech. Rast. Turk. IV, 174; Fedtsch. Rast. Turk. 734. —**Ic.**: Aitch. and Hemsl. op. cit. tab. 31 and 32.

Plant 65–200 cm high, glabrous. Leaves thick, oblong-elliptical, obtuse, with prominent, reticulate, pubescent veins beneath; basal leaves 37–50 cm long, 23–25 cm wide, along margin sinuate, on 7–16(18) cm long petioles; cauline leaves sessile, 18–35 cm long, 12–16 cm wide, entire, amplexicaul, auriculate, auricles rotund; upper leaves oblong,

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[1] Treatment by S.G. Gorschkova.

[2] From the Greek words *codon*—bell, and *cephalon*—head (from the shape of the campanulate capitulum).

3 cm long, 1.3 cm wide. Capitula 1.5–2.0 cm wide, sessile or on short, 0.5–2.5 cm long peduncles, in lax corymbose inflorescence. Receptacle alveolate; involucre many-rowed. Involucral bracts hard, concave, smooth, 433 acute, densely ciliate; outer bracts oblong-ovate 0.7–1.0 cm long, 0.3 cm wide, middle bracts broadly linear 1.5 cm, inner ones narrowly linear, as long as middle bracts, 1 mm wide. Florets as long as inner involucral bracts, yellow, tubular or obconical, glabrous, five-toothed, teeth 1 mm long. Achenes 3–5 mm long, brown with longitudinal ribs, subglabrous or pubescent; pappus 0.8–1.0 cm long, as long as or slightly shorter than florets, with numerous, short-plumose bristles. Flowering V.

Mountains, to 1,100 m, on gravelly-clayey steppe slopes. —*Soviet Central Asia*: Tien Shan, mountainous Turkmenia. *General distribution*: Iran. Described from northern Iran. Type in London.

Economic Importance. The leaves contain up to 500 mg% of vitamin C. It is a dye plant (Shalyt. *Dikorast. Polezn. Rast. Turkm. SSR*, 55, 122): an extract from its petals is used to dye silk yellow (Berezin in *Tr. Turkm. Fil. Akad. Nauk SSSR*, V, 101).

GENUS 1496. **Inula** L. [1, 2]

L. Sp. pl. (1753) 881; Günther Beck, Inulae Eur. (1881) 283. —*Limbarda* Adans. Fam. II (1763) 125. —*Enula* Neck. Elem. I (1790) 4. —*Corvisartia* Mérat. Nouv. fl. Paris (1812) 328.— *Schizogyne* Cass. in Dict. Sc. Nat. LVI (1828) 23

Capitula hemispherical, solitary or mostly numerous, in corymbose or sometimes capitate inflorescences. Involucral bracts numerous, imbricate, mostly unequal, gradually enlarging inward, occasionally equal, acute; outer bracts herbaceous, lanceolate, linear-lanceolate, ovate, ovate-triangular or oblong, sometimes with rhombic, oblong-ovate or round-spatulate apex; middle bracts often coriaceous, oblong-lanceolate, lanceolate, spatulate or linear-lanceolate, occasionally linear; inner bracts scaly, linear, linear-lanceolate, subulate or filiform, occasionally violet or reddish on tip; outer and middle bracts entirely but inner ones pubescent in upper part or only from middle usually with white, brown or blackish hairs or ciliate, sometimes glandular. Receptacle flat or more or less convex, punctate or alveolate; glabrous or fimbriate. Central florets (disk florets) infundibuliform-tubular, bisexual, yellow (brownish in *I. vulgaris*), in many whorls. Peripheral florets (ray florets) pistillate, ligulate, yellow (reddish in *I. vulgaris*), in one whorl, one and one-half to two times as long as

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[1] Treatment by S.G. Gorschkova.

[2] From the Greek word *inaein*—to cleanse (from its medicinal property).

involucre; ligules usually long, very rarely slightly longer or as long as 434 involucre, or ligules small or not developing and then ray florets filiform-tubular. Anthers with two long, sagittate, less often short filiform, truncate, ciliate basal appendages. Ligulate florets very rarely with three or four staminodes; stigma lobes broadened at tips, obtuse, ciliate. All achenes identical, prismatic or cylindrical, four-angled or ribbed, smooth or covered entirely, or only in upper part, with short straight hairs appressed above, or rarely in upper part with scattered glands. Pappus of one-rowed, usually numerous, somewhat unequal bristles, finely toothed in upper part, often connate at base.

Plants herbaceous, lacking caudex (except *Inula multicaulis* Fisch. and Mey.), mostly perennial, rarely biennial and annual with alternate entire leaves.

Genus *Inula* comprises about 100 species distributed in Europe, Asia and Africa.

1. Plants 1–2 m high; leaves 10–50 cm long, 6.5–25 cm wide; capitula 6–15 cm wide (including ligulate florets); involucre 2.5–6.5 cm wide......2

+ Plants shorter, (6)15–70 cm high; leaves 4–13 cm long, (0.3)1.0–3.5(5.0) cm wide; capitula 0.8–7.0(9.0) cm wide (including ligulate florets); involucre 0.6–1.2 cm wide......4

2. Capitula 9.5–15.0 cm wide. Involucre 4.5–6.5 cm wide; outer bracts lanceolate or ovately lanceolate, middle ones oblongly spatulate, inner ones oblongly linear or linear, acute. Ligulate florets 4.5–6.0 cm long, ligules 3.8–(5.3) cm long, 1.5 mm wide, scatteredly hairy on outer side; basal leaves oblongly ovate or oblongly elliptical......3. **I. magnifica** Lipsky

+ Capitula (4.5)6–8 cm wide; involucre 2.5–3.5 cm wide, involucral bracts different in shape; ligulate florets 2.6–3.7 cm long, ligules 1.6–3.0 cm long, 1–2 mm wide, smooth. Lower leaves elliptical or oblong......3

3. Capitula (6)7–8 cm wide, not many; outer involural bracts broadly lanceolate, tomentose, as also the middle ones, the latter spatulate or spoon-shaped, inner bracts linear or almost spatulate, all obtuse; ligulate florets three times as long as involucral bracts; stem and leaves pubescent......1. **I. helenium** L.

+ Capitula 4.5–6.5 cm wide, numerous; outer involucral bacts ovately lanceolate, middle and inner ones linear, all bracts smooth, sharp-pointed; ligulate florets two times as long as involucral bracts; stem and leaves glabrous......2. **I. grandis** Schrenk

4. Ligulate florets yellow and reddish, not conspicuous, not longer, occasionally slightly longer than involucral bracts and sometimes as long as central tubular florets..5

435 + Ligulate florets always yellow, longer, one and one-half to two times as long as involucral bracts and exceeding central tubular florets..9

5. Plants biennial, entirely finely arachnoid-hairy-tomentose; outer involucral bracts lanceolate with herbaceous, recurved glandular-hairy tip; ligulate florets reddish, somewhat shorter than middle and inner involucral bracts and as long as brown tubular florets ....29. **I. vulgaris** (Lam.) Trevisan

+ Plants perennial or almost semishrubs; ligulate and tubular florets with yellow corolla..6

6. Plants perennial; ligulate florets as long as or shorter than involucral bracts..7

+ Plants almost semishrubs; ligulate florets slightly longer than involucral bracts..8

7. Capitula 0.8–1.5 cm wide; involucre 0.7–1.2 cm wide, outer bracts 7 mm long, 1.5 mm wide, as long or one-third shorter than inner bracts; ligulate florets scatteredly hairy on outer side, as long as inner involucral bracts and one-third longer than tubular florets and pappus; ovary and achene hairy with pappus of 15 bristles ....30. **I. thapsoides** (Willd.) DC.

+ Capitula 1 cm wide; involucre 0.5–0.6 cm wide, outer involucral bracts 4.0–4.5 cm long and 0.7–1.0 mm wide, half to two-thirds as long as inner ones; ligulate florets glabrous, filiform, half as long as inner involucral bracts and two-thirds as long as tubular florets and pappus; ovary and achene glabrous, pappus of 12 bristles..31. **I. decurrens** M. Pop.

8. Leaves narrowly oblong or narrowly linear-spatulate, sometimes linear, 2.5–3.0 cm long, 2.5–4.0 mm wide, narrowed to base, upper leaves narrowly linear, 0.6–1.5 cm long, 0.6–1.0(2.5) mm wide, obtuse; capitula 1.7–2.0 cm wide; involucre 1.4 cm wide, outer and middle involucral bracts pubescent in upper part, inner ones glabrous, achenes 3 mm long, smooth, pubescent only in upper part..32. **I. multicaulis** Fisch. and Mey.

+ Leaves lanceolate or lanceolate-linear, lower leaves 5–9 mm long, 5–6 mm wide, upper 3–5 mm long, 1.8–3.0 mm wide, thick, acute, at base cordate. Capitula 1.5 cm wide; involucre 0.8 cm wide, involucral bracts pubescent in upper part with sparse golden glands; achenes 1.2–2.0 mm long, with occasional golden glands ....33. **I. salsoloides** (Turcz.) Ostf.

9. Ovary and achenes glabrous, occasionally sparsely short-hairy only in upper part..........10

+ Ovary and achenes pubescent throughout..........19

10. Capitula 6–9 cm wide; involucre 2.5–4.5 cm wide, involucral bracts narrowly lanceolate, linear, or linear-subulate..........11

+ Capitula 0.7–6.0(7.0) cm wide; involucre 0.5–1.8 cm wide, involu-
436 cral bracts broadly lanceolate, ovate-lanceolate, oblong-ovate, or
ovate..........12

11. Lower leaves oblanceolate or oblong-spatulate, broad-petiolate; upper leaves oblong or oblong-lanceolate, sessile; all leaves entire or indistinctly finely glandular and toothed. Capitula solitary, 6–7 cm wide; involucre 3 cm wide; outer and middle involucral bracts entirely, but inner only in upper part, covered with brown or blackish erect hairs; ligulate florets bright yellow; achenes smooth..........5. **I. orientalis** Lam.

+ Leaves elliptically oblong, sessile with scattered fine teeth along margin, terminating in glands. Capitula 8–9 cm wide; involucre 2.5–4.5 cm wide; outer and middle involucral bracts entirely densely brown-ciliate, but inner ones sparsely ciliate from middle; ligulate florets yellow; achenes scatteredly pubescent only in upper part..........4. **I. grandiflora** Willd.

12. Capitula numerous, 0.7–1.4 cm wide; involucre 0.5–0.7 cm wide 13

+ Capitula larger, (1)3–6(7) cm wide; involucral bracts (0.7)1.5–2.3 cm wide..........14

13. Plant lanate-villous (excluding corolla, ovary, and achenes), with scattered, small golden glands, rhizome horizontal, creeping, branched. Capitula numerous, 0.7–1.0 cm wide, on 1 cm long peduncles, in compact corymbs; involucre 5–7 mm wide..........9. **I. germanica** L.

+ Plant covered with scattered golden glands; root short-truncate, the collar densely white-lanate. Capitula less numerous, (3.0)1.4 cm wide, on 3.0–4.5 cm long peduncles; involucre 7–8 mm wide ....6. **I. seidlitzii** Boiss.

14. Stem, leaves and involucral bracts densely covered with dark brown, spreading long hairs; leaves elliptical or ovate-oblong. Capitula solitary or less numerous (2.5)7.0 cm wide; involucre 1.5–1.8 cm wide..........7. **I. hirta** L.

+ Plants glabrous or sparsely pubescent. Capitula 3.0–4.5 cm wide; involucre 0.7–2.3 cm wide..........15

15. Leaves narrowly linear-lanceolate or linear-oblong, 3–4(6) mm wide, appressed above, tapering to obtuse callose cusp, with five to seven prominent parallel veins. Capitula 2.5–4.0(4.5) cm wide,

solitary, occasionally three to four, involucre 1.5–1.8(2.3) cm wide..8. **I. ensifolia** L.

+ Leaves oblong, oblong-lanceolate, or oblong-ovate, (0.8)1.2–3.0 cm wide, pinnately nerved..16

16. Capitula 2.5–4.0 cm wide; involucre 1.2–2.3 cm wide. Leaves 4–10 cm long, 1–3 cm wide, thin, glabrous, with scattered teeth and small spinules only along margin, occasionally with short and scattered bristles along veins beneath..17 437

+ Capitula 1–3 cm wide; involucre 0.7–2.0 cm wide. Leaves 2–5 cm long, 0.8–2.5 cm wide, thick, usually covered on both sides with hairs, occasionally glabrous..18

17. Capitula 2.5–4.0 cm wide; involucre 1.2–1.4 cm wide; ligulate florets yellow, usually one and one-half times as long as involucral bracts, tubes as long as pappus; tubular florets yellow, as long as pappus..12. **I. salicina** L.

+ Capitula 4 cm wide, mostly solitary; involucre 2.3 cm wide; ligulate florets two times as long as involucral bracts, ligulate yellow with reddish veins, reddish in lower part, shorter than pappus; tubular florets yellow, reddish in lower part, exceeding pappus...13. **I. kitamurana** Tatew.

18. Leaves oblong-lanceolate or oblong-ovate, 2–5 cm long, 0.8–2.5 cm wide, short-acuminate or more or less subobtuse, entire or with indistinct small teeth, with numerous spinules. Stem branched only in upper part..10. **I. aspera** Poir.

+ Leaves narrowly lanceolate, 5–9 cm long, 0.5–1.2 cm wide or linear-lanceolate (on lateral nonflowering shoots), all long-acuminate, finely serrate-dentate, Stem branched from base or middle ....11. **I. sabuletorum** Czern.

19. Plants without stem, very rarely with strongly reduced stems, with numerous basal leaves in a rosette...20

+ Plants with well developed leafy stems...21

20. Leaves oblong-spatulate 2.5–3.0 cm long (including petiole), 1.2 cm wide, glabrous, long-ciliate, on 0.5–1.0 cm long petioles. Capitula 1.4–2.0 cm wide, solitary; involucre 1.8–2.5 cm wide, outer involucral bracts oblong, subobtuse, inner bracts lanceolate, reddish in upper part; ligulate florets two times as long as involucral bracts, reddish in upper part and along veins...27. **I. acaulis** Schott and Kotschy

+ Leaves oblong or oblongly ovate, (2.5)4–16 cm long (including petiole), 2.5–3.5 cm wide, basally narrowed to winged, 2.5–3.5 cm long petiole, on both sides with scattered, but along midrib and beneath, with dense, long, white, fine glandular hairs. Capitula 1.5–3.0 cm wide, numerous, in compact, almost capitate inflorescence; involucre 1.2–1.5(2.0) cm wide, outer involucral bracts lanceolate or lanceolate-linear, acute, inner bracts linear or narrowly linear, apically violet; ligulate florets slightly longer than involucral bracts......................28. **I. rhizocephala** Schrenk.

438 21. Capitula large, (2)2.5–5.0(6) cm wide; involucre 1.7–3.5 cm wide 22

+ Capitula mostly smaller, 0.8–2.5(3.0) occasionally 4.5 cm wide; involucre 1–2(2.3) cm wide..25

22. Lower leaves ovate, ovate-lanceolate, or oblong-ovate, sessile or narrowed into 1–2 cm long petioles; involucral bracts almost equal, outer ones lanceolate..23

+ Lower leaves lanceolate, lanceolate-spatulate, or oblongly lanceolate, occasionally almost spatulate, narrowed into 3–7 cm long petioles; involucral bracts unequal, outer ones ovate-oblong or ovate-lanceolate...24

23. Plants hairy (except tubular florets) and covered with golden glands (except ovary and achenes); leaves bluish-green, oblong-ovate, sessile, obtuse. Capitula one or two, occasionally four; ligulate florets on outer side covered with hairs and scattered glands...16. **I. glauca** Winkl.

+ Plants hairy (except tubular florets); leaves green, ovate-lanceolate, acute, lower leaves narrowed into petioles, petioles 1–2(2.5) cm long. Capitula solitary; ligulate florets covered on outer side only with hairs..............................17. **I. schmalhausenii** Winkl.

24. Lower leaves oblong-lanceolate or oblong-spatulate, 7–16 cm long, 2.0–2.8 cm wide, narrowed into 4–7 cm long, winged petiole; upper leaves oblong or ovate-oblong, 2.2 cm wide, basally cordate, amplexicaul, auriculate. Capitula two to four (occasionally solitary) in corymb, 4–6 cm wide; involucre 2.5–3.5 cm wide, with densely reddish-pubescent bracts.........15. **I. mariae** Bordz.

+ Lower leaves lanceolate or lanceolate-spatulate, 7–9 cm long, 0.6–1.0 cm wide, narrowed into slender, 3 cm long petiole; upper leaves linear, 0.7–1.0 cm wide, basally narrowed but sessile, without auricles. Capitula solitary, 4 cm wide; involucre 1.7–2.5 cm wide; outer and middle bracts from middle densely white-pubescent..14. **I. montbretiana** DC.

25. Stem, peduncles, and involucral bracts along margin covered with white hairs basally thickened or in furrows................................26

+ Plants sparsely lanate, with white fine hairs................................30

26. Capitula 1.5–2.5 cm wide; involucre 1–2 cm wide, inner bracts two times as long as outer...27

+ Capitula 2.5–3.5(4) cm wide; involucre (1.5)1.8–2.0 cm wide, inner bracts somewhat longer or as long as outer ones.................28

27. Leaves ovate-elliptical. Capitula 2.5 cm wide; involucre 2 cm wide; involucral bracts pubescent; ligulate florets dark yellow, 439 ligules in lower part near tube covered with white, upwardly appressed hairs and scattered fine glands..21. **I. grombczewskii** Winkl.

+ Leaves oblong-elliptical, ovate, or oblong-ovate. Capitula 1.5–2.0 cm wide; involucre 1.0–1.7 cm wide; involucral bracts densely pubescent and sparsely glandular; ligulate florets yellow or pale yellow, in lower part near tube covered with only scattered fine glands..22. **I. rubtzovii** Gorschk.

28. Lower leaves elliptical or oblong-elliptical, 10.0–13.5 cm long, 2.6–3.0(4.5) cm wide. Capitula 4 cm wide; involucre 1.7 cm wide; involucral bracts almost equal, outer ones pubescent on outer side, rest glabrous................................26. **I. japonica** Thunb.

+ Lower leaves narrow-oblong, lanceolate or oblong-linear, 7–17 cm long, 0.8–2.5 cm wide. Capitula 2.0–3.5 cm wide; involucre 1.5–2.0 cm wide; inner involucral bracts somewhat longer than outer ones..29

29. Lower leaves narrowly oblong or lanceolate, 7–17 cm long, 0.8–2.5 cm wide, all leaves glabrous or sometimes hispid beneath and along margin; involucral bracts acute with short stiff; cilia on tubercles; ligules of ligulate florets covered on outer side in lower part with yellow sessile glands; tubular florets slightly longer than pappus..18. **I. caspica** Blum.

+ Lower leaves oblongly linear, 9 cm long, 1.5 cm wide, all leaves glabrous above, pubescent beneath; outer and middle involucral bracts from base, but inner bracts in upper part, ciliate outside; ligulate florets with smooth ligules; tubular florets as long as pappus..24. **I. macrolepis** Bge.

30. Capitula in compact corymbs..31

+ Capitula in lax corymbs..32

31. Upper leaves sessile, short-decurrent, amplexicaul, laterally with round broad, auricle-like appendages at base. Capitula 1.2–2.3 cm wide; involucre 1.0–1.5 cm wide, outer bracts divergent, inner ones linear-lanceolate, 0.7–1.0 mm wide, smooth ciliate; ligulate florets smooth.............................20. **I. auriculata** Boiss. and Bal.

+ Upper leaves at base cordate, without auricles. Capitula 3–4 cm wide; involucre 1.7–2.0(2.3) cm wide; outer involucral bracts straight, erect, inner ones linear, 0.3–0.5 mm wide, in upper part reddish, pubescent on outer side and with fine golden glands; ligulate florets with ligules covered on outer side with white hairs and fine golden glands.............................19. **I. oculus-christi** L.

440 32. Leaves linear-lanceolate, upper ones sessile. Capitula 0.8–2.8 cm wide; involucre on outer side with sparse golden glands; achenes with pappus of 25 bristles..........................25. **I. lineariifolia** Turcz.

+ Leaves oblong-lanceolate or lanceolate, sessile, with cordate base, amplexicaul, sometimes with auricles. Capitula 3.0–4.5(5) cm wide; involucre 1.3–2.0(2.2) cm wide; ligulate florets one and one-half times as long as involucral bracts, smooth; achenes with pappus of 15 or 16 bristles.............................23. **I. britannica** L.

Section 1. CORVISARTIA (Mérat) Dumort. Fl. belg. (1827) 68; Beck, l. c. 8. —**Corvisartia** Mérat. Nouv. fl. Paris (1812) 328; pro gen. —Receptacle densely glandular along edges of alveoles; ligulate florets two to two-and-one-half times as long involucre. Anther appendages long-fimbriate, one-third to half as long as anthers; achenes five-, rarely four-angled, ribbed, truncate, smooth; pappus with short-connate bristles.

1. **I. helenium** L. Sp. pl. (1753) 881; M.B. Fl. taur.-cauc., II, 316; Ldb. Fl. alt. IV, 94; DC. Prodr. V, 463; Ldb. Fl. Ross. II, 500; Boiss. Fl. or. III, 186; Schmalh. Fl. II, 49; O. and B. Fedtsch. Perech. Rast. Turk. IV, 170; Fedtsch. Rast. Turk., 734; Grossh. Fl. Kavk. IV, 105; Krylov, Fl. Zap. Sib. XI, 2705; Klokov in Vizn. Rosl. URSR, 528, 529; Kirpiczn. in Majevsk. Fl., Izd. 8, 569. —*Aster helenium* Scopoli Fl. carn. ed. 2, II (1772) 171. —*Helenium grandiflorum* Gilib. Fl. lithuan. III (1781) 204 and Exerc. Phytog. Pl. Europ. I (1792) 168. —**Ic.**: Varlikh, Russk. Lek. Rast. II, Plate 54; Fedtsch. and Fler. Fl. Evrop. Ross., Fig. 959; Syreistsch. Ill. Fl. Moskovsk. Gub. III, 259; Hegi, Ill. Fl. IV, 1, 475, fig. 240; Kom. Sbor, Sushka i Razved. Lek. Rast., Izd. 3, Plate 16; Zemlinsk. Lek. Rast. SSSR, Izd. 2, 100; Pavl. Dikie Polezn. i Tekhn. Rast. SSSR, 345, Fig. 92; Larin et al., Kormov. Rast. Senok. i Pastb., 446, Fig. 365. —**Exs.**: Fl. exs. Austro-Hung. No. 1824.

Perennial. Plant 60 cm–2.5 m high; rhizome woody, 1.0–1.3 cm thick; nodose, with strong odor; stem erect, 0.6–1.2 cm thick, longitudinally sulcate, densely pubescent with white multicellular hairs, with short branches in upper part. Leaves irregularly small-toothed-serrate, somewhat rugose above, sparsely puberulent, yellowish- or grayish-velutinous beneath; basal and lower cauline leaves oblong-elliptical, 40–50 cm long, 15–25 cm wide, short-acuminate, narrowed into 18–35 cm long petiole; middle leaves ovate-lanceolate, 15–35 cm long, 5–18 cm wide, acuminate, sessile, with cordate, amplexicaul base; upper leaves lanceolate, acute, (3.5)6–9 cm long, (1)1.8–4.0 cm wide. Capitula (6)7–8 cm wide, less numerous, on thick 6–10 cm long peduncles, axillary, in middle with broadly lanceolate, 3 cm long and 1 cm wide bract, in lax receme or corymb. Involucre 2.5–4.5 cm wide with numerous imbricate bracts;

outer bracts herbaceous, broad-lanceolate or ovate, 1.0–1.3 cm long, 4.5–
441 5.0 mm wide, obtuse, finely toothed, like middle bracts grayish-tomentose; middle bracts spatulate, almost spoon-shaped, somewhat recurved, 1.0–1.5 cm long, 3–4 mm wide, green, in upper part broadened, roundish, obtuse, inner bracts membranous linear or spatulate, 1.3–1.8 cm long, 1.5–2.5 mm wide, obtuse, glabrous, slightly exceeding the outer. Florets golden yellow; peripheral florets ligulate, 3.2–3.7 cm long, corolla tube 6–7 mm long, two-thirds as long as pappus, ligules narrow-linear, 2.6–3.0 cm long, 1.0–1.5 mm wide, four- or five-veined, with three acute teeth at apex; tubular central florets obconical, 1.0–1.2 cm long, slightly exceeding or as long as pappus, five-toothed. Achenes prismatic, brown, glabrous, 3–5 mm long, 0.5 mm wide, longitudinally ribbed; pappus brownish-white, 2–3 times as long as achenes, with numerous bristles. Flowering VI–IX.

Pine woods, larch forests and shrubby thickets; mountains (to 570–2,000 m) from middle to subalpine zone, meadows, meadow and steppe slopes, oak and walnut forests, forest glades and along banks of mountain rivers and streams. —*European Part:* Karelia-Lapland (in the vicinity of Povenets), Dvina-Pechora, Baltic Region, Ladoga-Ilmen, Upper Volga, Volga-Kama, Upper Dnieper, Middle Dnieper, Volga-Don, Trans-Volga, Upper Dniester, Bessarabia, Black Sea Region, Crimea, Lower Don, Lower Volga; *Caucasus:* Ciscaucasia, Dagestan, western, eastern, and southern Transcaucasia; *Western Siberia:* Upper Tobol, Irtysh, Altai; *Soviet Central Asia:* Aralo-Caspian, Balkhash Region, Dzhungaria-Tarbagatai, Tien Shan, Pamiro-Alai. *General distribution:* Scandinavia, Central Europe, Atlantic Europe, Mediterranean, Armenia and Kurdistan, Iran, Dzhungaria-Kashgaria, Mongolia (north). Described from western Europe. Type in London.

Economic Importance. It is an ornamental, nectariferous, and medicinal plant. The rhizomes are used in folk medicine as expectorant, diuretic and tonic; it contains inulin and other polysaccharides, a bitter substance, 1–2% of an essential oil, with alantolactone as its main constituent (Zemlinskii, *Lekarstv. Rast. SSSR,* Ed. 2, 100). The leaves contain 39 mg% of vitamin C (Pankova in *Tr. Bot. Inst. Akad. Nauk SSSR, Ser.* V, No. 2, 439). An alcoholic extract of the rhizome of elicampone has a bactericidal effect (Balanov in *Izv. Akad. Nauk. KazSSR, Ser. Microbiol.,* No. 1, 45).

2. **I. grandis** Schrenk ex Fisch. and Mey. Enum. pl. nov. 1, VI (1841) 50. —*I. macrophylla* Kar. and Kir. in Bull. Soc. Nat. Mosc. XIV, 3 (XII 1841) 438. —*Codonocephalum grande* (Schrenk) B. Fedtsch. in O. and B. Fedtsch. Perech. Rast. Turk. IV (1911) 174; Fedtsch. Rast.

Turk., 734. —**Ic.**: Larin et. al., Kormov. Rast. Senokos. i Pastb. SSSR, 443, Fig. 352.

Perennial. Plant glabrous, sparsely pubescent above, 35 cm–2 m high; stem erect, 4–8 mm thick, cylindrical, longitudinally sulcate, branched. Leaves coriaceous, lustrous, glabrous, covered with white multicellular hairs along veins beneath, in lower part with thickened hairs and between veins, with fine glands, toothed-serrate; basal leaves oblong, 21–62 cm long, 11–24 cm wide, decurrent, on 10–15(17) cm long petioles, subacute; cauline leaves 22 cm long, 9–13 cm wide, semiamplexicaul, 442 sessile, auriculate, auricles adnate; upper leaves lanceolate, 3.5–9.0 cm long, 1–4 cm wide. Capitula numerous, 4.5–6.5 cm wide, on (2)5–15 cm long peduncles, in axils of floral leaves, in lax corymbs. Involucre 2.0–3.5 cm wide; involucral bracts imbricate, numerous; outer bracts ovate-lanceolate, 1 cm long, 2.5 mm wide, colored in upper part; middle bracts linear, 1.3 cm long, 1.0–1.2 mm wide; inner bracts narrow-linear, almost as long as middle ones, 0.5 mm wide, acute, ciliate. Ligulate florets 2.6–2.9 cm long, yellow, glabrous, with 8–9 mm long tube, almost as long as pappus and linear, 1.6–1.7 cm long, 1–2 mm wide ligules, with three to six(seven) veins, with three acute teeth at apex; tubular florets 1.0–1.2 cm long, yellow with five 0.8 mm long teeth, sparsely glandular on outer side. Achenes cylindrical, 2–3 mm long, 1.5 mm wide, glabrous, brown, with 10–12 white, fine, longitudinal ribs; pappus 2.5–4 times as long as achenes, with numerous bristles. Flowering VI–VII.

Steppe slopes and stony talus of mountains, at 950–2,500 m, as weed in wheat fields. —*Soviet Central Asia:* Dzhungaria-Tarbagatai, Syr-Darya, Pamiro-Alai, Tien Shan. *General distribution:* Iran. Described from Soviet Central Asia (Karatau Mountains). Type in Leningrad.

Economic Importance. A floral extract, after fixing by ammonia, dyes silk bluish-green, and after neutral fixing, straw-yellow. A root extract dyes silk after fixing as follows: with soda—bluish-green, with ammonia—gray, with hydrochloric acid—yellowish, and with chrome alum—olive (according to L.A. Berzin in *Tr. Turkm. Fil. Akad. Nauk SSSR,* No. V, 101).

The roots contain inulin, 13% in summer and 27% in the fall, 0.01% essential oil and a large quantity of resin (Larin et al., op. cit., 443—according to Sumnevich).

The leaves are found to contain 44.9 mg% of vitamin C (Larin et al., op. cit., 443—according to Andreichuk). The roots can be used for making alcohol, which goes, in certain places, for fuel. A dye plant (Shalyt. *Dikorast. Polezn. Rast. Turkm. SSR,* 40, 97, 157).

3. **I. magnifica** Lipsky in Tr. Bot. Sada XIV (1897) 282; Grossh. Fl. Kavk. IV, 105. —**Ic.**: Kolakovsk. Fl. Abkhaz. IV, Plate XXI; Fl. Gruz. VIII, Plate 386. —**Exs.**: GRF No. 3245.

Perennial. Plants 1–2 m high; stems erect, 0.7 cm thick, longitudinally sulcate, covered with long white multicellular hairs. Lower leaves oblong-elliptical or oblong-ovate, up to 45–50 cm long, 24 cm wide, petiolate, petiole up to 36 cm long; upper leaves ovate-oblong, (10)16–32 cm long, 6.5–22.0(26.0) cm wide, sessile, in lower part narrowed, all acute, coarsely serrate-toothed, scatteredly pubescent above, densely be-
443 neath, with white multicellular hairs on tubercles and numerous fine, sessile, roundish golden glands, with prominent veins beneath; floral leaves deltoid-lanceolate, 1.5–3.0 cm long, 0.5–1.0 cm wide, usually surrounding base of capitula. Capitula 9.5–15.0 cm wide, on densely pubescent 8–25 cm long peduncles, solitary or in groups of (two) three or four in lax corymbs. Involucre 4.5–6.5 cm wide, many-rowed with many bracts; outer bracts herbaceous, lanceolate or ovate-lanceolate, 1.0–1.5 cm long, 0.7–1.5 cm wide, green, along margin toothed-fimbriate, densely pubescent; middle bracts coriaceous, whitish-yellow, oblong-spatulate, 1.2–2.0 cm long, 0.4–0.5 cm wide, in upper part dark violet-reddish, along margin indistinctly toothed, glabrous only in middle, sparsely puberulent in upper part; inner bracts oblong-linear or linear, 1.8–2.0 cm long, (0.8)1.0–1.5 mm wide, acute, membranous, yellowish-brown, in upper part reddish-violet, glabrous, along margin finely toothed and densely white-ciliate. Ligulate florets yellow, two and one-half to three times as long as involucral bracts, corolla tube 7 mm long, two-thirds as long as pappus, ligules linear, 3.8–5.3 cm long, 1.5 mm wide, with (four) six to eight reddish veins, sparsely pubescent and finely glandular on outer side, with two or three teeth (3–4 mm long); tubular florets 1 cm long, as long as pappus, five-toothed, with sparse fine golden glands outside. Achenes linear-oblong, 3 mm long, 0.5 mm wide, glabrous, longitudinally ribbed; pappus yellowish, three and one-half times as long as achenes, with numerous (40) bristles. Flowering VII–VIII.

Mountains from middle to subalpine zone (at 1,250–2,100 m), mixed forests, edges and in shrubby thickets. —*Caucasus*: Ciscaucasia, western Transcaucasia. Endemic. Described from Lake Kardabacha in the upper reaches of the Mzymta River. Type in Leningrad.

Note. In general habit, *I. magnifica* resembles *Telekia speciosa* Baumg., but the latter is distinguished by deltoid-cordate, coarsely toothed leaves, a long setaceous receptacle, and achenes with a membranous, toothed short border.

Section 2. ENULA Duby, Bot. gall. I (1828) 267 emend. Beck, Inulae Europ. (1881) 9. —*Enula* Neck. Elem. I (1790) 4, pro gen. —Section *Inulotypus* Dumort. Fl. belg. (1827) 68 p. p. —Section *Bubonium* DC. Prodr. V (1836) 464 p. p. —Section *Euinula* and *Pseudo-conyza* Gern. Fl. de la chaine juras. (1865) 423 and 425. —Section *Euinula* Willk. and

Lange, Prodr. fl. hisp. II (1870) 43. —Receptacle glabrous; anther appendage fimbriate, one-third(one-fifth) as long as anthers; achenes five-angled, ribbed, at apex truncate or slightly elongate, glabrous or pubescent; pappus bristles free or basally short-connate.

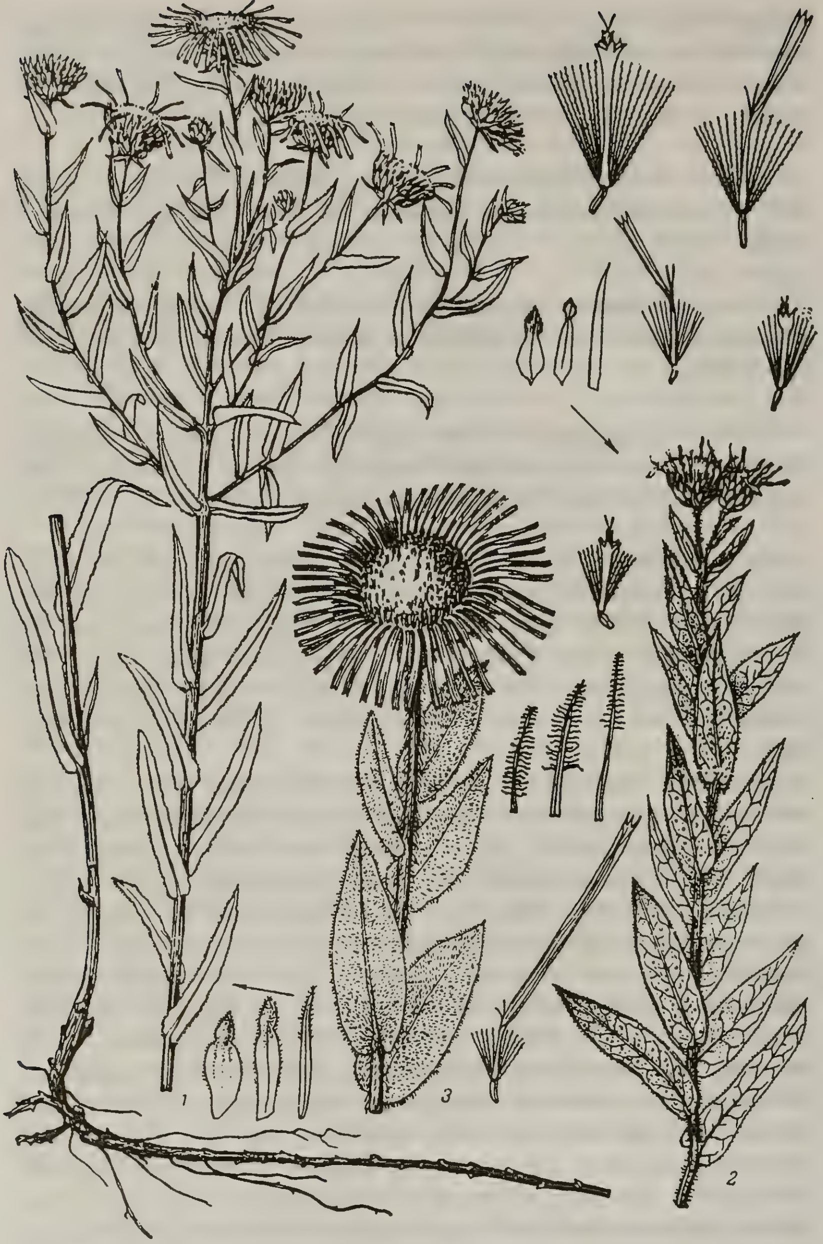
444 *Subsection* 1. **Longeligulatae** Beck, Inulae Europ. (1881) 11, 15. —Ligulate florets with ligules to two times as long as involucral bracts.

Group 1. **Leiocarpae** Boiss. Fl. or. III (1875) 185. —Ovary and achenes glabrous, in upper part very rarely with scattered hairs; pappus of numerous bristles.

Series 1. Grandiflorae Gorschk. Capitula 6–9 cm wide; involucre 2.5–4.5 cm wide, outer involucral bracts linear-lanceolate or narrow lanceolate, almost as long as inner linear or linear-subulate bracts.

4. **I. grandiflora** Willd. Sp. pl. III, 3 (1800) 2096; M.B. Fl. taur.-cauc. II, 318 and III, 575; DC. Prodr. V, 468; Ldb. Fl. Ross. II, 507; Boiss. Fl. or. III, 186; Grossh. Fl. Kavk. IV, 106. —*I. alpina* Adams in Web. and Mohr. Beitr. I (1805) 68. —*I. orientalis* Beck, Inulae Eur. (1881) 28, non Lam. —**Ic.**: Gard. and Forest, VI, 406; Silva Tarouca, Freiland-Stauden, 127. —**Exs.**: Fl. cauc. exs. No. 172; Gerb. Fl. SSSR, No. 3244.

Perennial. Plant 40–70 cm high, entirely covered with occasional white and sometimes brown multicellular basally thickened hairs. Root 1.0–1.3 cm thick, woody. Stem solitary, longitudinally ribbed, erect, simple, often brownish, densely leafy. Leaves elliptical-oblong, 5.0–9.5(11) cm long, 2.5–4.5(5) cm wide; lower leaves narrowed at base, upper ones almost cordate, amplexicaul, auriculate; all leaves sessile, subacute, with occasional small teeth terminating in glands, sometimes coarsely toothed (var. *dentata* Akinf.); leaves on peduncles 4.5 cm long, 2.3 cm wide. Capitula 8–9 cm wide, solitary terminal. Involucre many-rowed, 2.5–4.5 cm wide, the bracts similar; outer bracts yellow, narrowly lanceolate, 1.3 cm long, 0.5 mm wide; inner bracts membranous, yellowish linear-subulate, 0.3 mm wide, all finely acuminate, the outer ones densely yellowish-long-ciliate, the inner ones, sparsely from middle. Ligulate florets yellow, two times as long as involucral bracts, with 5–6 mm long tube, as long as or somewhat longer than pappus, ligules 2.5 cm long, 0.8 mm wide, linear with four, darker sparsely pilose veins, three-toothed; tubular florets 6–7 mm long, shorter or as long as pappus, yellow, five-toothed. Achenes cylindrical, 2 mm long, 0.3 mm wide, brown, longitudi-



445 Plate XXVII.

1—*Inula sabuletorum* Czern. Habit of plant, involucral bracts, ligulate and tubular florets; 2—*I. aspera* Poir. Habit of plant, involucral bract, ligulate and tubular florets; 3—*I. orientalis* Lam. Habit of plant, leaf, involucral bract, ligulate and tubular florets.

nally ribbed, with scattered short hairs above; pappus two and one-half times as long as achenes, with 17–20 bristles. Flowering VII–VIII.

Mountains, at 1,850–2,800 m in lower range of alpine zone, 447 subalpine and alpine meadows, edges of beech scrub-forest sometimes forming whole thickets. —*Caucasus*: Ciscaucasia, Dagestan, western and eastern Transcaucasia. *General distribution*: Balkans-Asia Minor, Indo-Himalayas (northwest). Described from the Caucasus. Type in Berlin.

5. **I. orientalis** Lam. Encycl. III (1789) 255. —*I. glandulosa* Willd. Sp. pl. III, 3 (1800) 2097; M.B. Fl. tuar.-cauc. II, 319 and III, 575; DC. Prodr. V, 468; Ldb. Fl. Ross. II, 507; Boiss. Fl. or. III, 187; Beck l. c. 29; Trautv. in Tr. Peterb. Bot. Sada, VII, 2, 446; Schmalh Fl. II, 50; Grossh. Fl. Kavk. IV, 106. —*I. glandulosa* Adams in Web. and Mohr. Beitr. z. Naturk. (1805) 68. —*I. grandiflora* var. *glandulosa* Parsa, Fl. Iran, III (1943) 160. —**Ic.**: Bot. Mag. 44, tab. 1907, Bot. Reg. IV, tab. 334. —**Exs.**: GRF No. 270.

Perennial. Plant 15–50 cm high, all mildly rough-pubescent, covered by long, slender, multicellular hairs. Stem solitary, erect or somewhat bent, longitudinally ribbed, densely leafy, sometimes reddish below. Leaves thin, entire or inconspicuously finely glandular-toothed, pubescent on both sides; basal leaves sparse, obovate, 1.2–3.0 cm long, 0.4–0.6 cm wide, obtuse, on 0.3–0.5 cm long petioles; lower leaves oblanceolate or oblong-spatulate, 6–13 cm long, 2.5–3.5 cm wide, obtuse, basally narrowed into thick, 4–5(6) cm long petiole; upper leaves oblong-lanceolate, sometimes ovate, 4–10 cm long, 2–3 cm wide, at base cordate, amplexicaul and decurrent, with adnate auricles, sessile, short-acuminate. Capitula solitary, 6–7 cm wide. Involucre 3.0–3.5 cm wide, many-rowed; outer bracts lanceolate-subulate, 0.9–11.0 cm long, 1.3 mm wide; inner bracts scaly, linear, almost subulate, 1.2 cm long, 1 mm wide, glabrous only in upper part, outer bracts densely covered with brown or blackish, 2.0–2.5 mm long, multicellular erect hairs; ligulate florets bright yellow, almost two times as long as involucral bracts, with 4 mm long tube, as long as pappus, ligules 1.9–2.0 cm long, 2 mm wide, narrowly lanceolate, four- or five-veined and with three fine teeth, on outer side and particularly in lower part covered with scattered white multicellular hairs; tubular florets 5–6 mm long, slightly longer than pappus, one-fifth to one-fourth as long as ligulate florets, glabrous, five-toothed, teeth acute. Achenes linear-oblong, 2.5 mm long, 0.5 mm wide, longitudinally ribbed, glabrous; pappus two times as long as achenes, of 13 bristles. Flowering VII–VIII. (Plate XXVII, Fig. 3).

Mountains at 1,500–2,800 (3100) m in alpine and subalpine meadows, on rocks, alluvial deposits, riverine deposits and in pine forests. —

Caucasus: Ciscaucasia, Dagestan, western, eastern and southern Transcaucasia. Endemic. Described from Georgia. Type in Leningrad.

Series 2. Seidlitzianae Gorschk. —Sect. **Carnosa** Avet. in Izv. Akad. Nauk Arm SSR, VIII, No. 6 (1955) 105. —Capitula 1.4 cm in wide; 448 involucre 0.7–0.8 cm wide, with linear-lanceolate outer bracts, two-thirds as long as linear, almost filiform, inner bracts; ligulate florets sometimes with three or four staminodes. Leaves more or less succulent.

6. **I. seidlitzii** Boiss. Fl. or. III (1875) 189; Takht. and Fed. Fl. Erev., 303 (in Armenian language); Grossh. Opredel. Rast. Kavk., 447. —**Ic.**: Takht. and Fed. Fl. Erev., Plate 106.

Perennial. Plant 15–35 cm high, pale green, entirely covered with scattered golden glands. Root short truncate, the collar densely white-lanate. Stem thick, longitudinally sulcate, branched. Leaves succulent, undivided; lower leaves oblong-lanceolate, 3.5–4.5 cm long, 1 cm wide, with 1–2 cm long petiole; middle leaves broadened at base, auriculate, 5–6 cm long, 0.5 cm wide; upper leaves linear, 1–2 cm long, 0.2 cm wide, amplexicaul, acute. Capitula hemispherical, 1.4 cm wide, on 3.0–4.5 cm long peduncles. Involucre 7–8 mm wide, many-rowed; outer involucral bracts linear-lanceolate, 3.5–4.0 mm long, 0.4 mm wide acute; inner bracts linear or almost filiform, 5 mm long, 0.2–0.3 mm wide, long-acuminate, all bracts densely glandular and in upper part squarrose. Ligulate florets yellow, 7.0–7.5 mm long, one and one-half times as long as involucre, with 3 mm long tube, as long as pappus, ligules linear, 4 mm long, 1 mm wide, three-toothed; tubular florets slightly shorter than pappus, with five acute, outwardly glandular teeth, anthers with short fimbriate appendages, one-fifth as long as anthers. Achenes oblong, 1.0–1.2 mm long, 0.5 mm wide, longitudinally sulcate, glabrous; pappus of 13(18) 20 bristles, two and one-half to three times as long as achenes. Flowering VII.

Mountains, in wet places, near mineral springs. —*Caucasus*: Southern Transcaucasia. *General distribution*: Iran. Described from Iranian Azerbaidzhan. Type in Geneva.

Note. A rare plant, collected for the first time in the USSR in 1937 by A.L. Takhtajan in Armenia (village of Agbash near the upper reaches of the Tutu-dzhur River and from near the village of Akhpat).

Series 3. Hirtae Gorsch. Capitula less numerous or solitary, 2.5–7.0 cm wide; involucre 1.5–1.8 cm wide, outer involucral bracts broadly lanceolate, 1.2–1.5 mm wide, as long or slightly longer than linear-lanceolate or linear inner bracts.

7. **I. hirta** L. Sp. pl. (1753) 883; DC. Prodr. V, 466; Ldb. Fl. Ross. II, 503; Boiss. Fl. or. III, 187; Beck l. c. 29; Schmalh. Fl. II, 50; O. and B. Fedtsch. Perech. Rast. Turk. IV, 171; Grossh. Fl. Kavk. IV, 106; Krylov, Fl. Zap. Sib. XI, 2706; Klokov in Vizn. Rosl. URSR, 529; Kirpiczn. in Majevsk. Fl. Izd. 8, 571. —*I. hirsuta* Guldenst. Reisen durch Russl. und Caucasisch. Gebürge, II (1791) 72. —*I. involucrata* Kalenicz. in Bull. Soc. Nat. Mosc. XVIII, (1845) 234. —*I. melanolepidea* Kalenicz. ibid. 235.—*Aster hirtus* Scop. Fl. carn. ed. 2 (1772) 173. —*Pulcaria hirta* Presl. Fl. cechic. (1819) 178. —**Ic.**: Rchb., Ic. Fl. Germ. XVI, tab. 449 927; Syreistsch., Ill. Fl. Mosk. Gub. III, 251; Hegi, Ill. Fl. VI, 1, tab. 262, 2–2b; Geideman, Opredel. Rast. Moldavsk. SSR, Fig. 32. —**Exs.**: GRF No. 724; Herb. normale No. 684; Fl. Italica exs. No. 1982; Fl. Hercegov. exs. No. 202; Fl. Siles, exs. No. 833; Fl. Gall. et Germ, exs. No. 385.

Perennial. Plant 25–50 cm high, densely covered throughout with multicellular, reddish, spreading long hairs, sessile on small tubercles (except on corollas of ligulate and tubular florets, ovary and achene). Rhizome woody; stem usually solitary, straight, longitudinally ribbed, sometimes reddish-brown. Leaves almost coriaceous, ovate-oblong or ovate-lanceolate, 4–8 cm long, 0.8–1.5(2.4) cm wide, subobtuse or short-acuminate, entire or with scattered fine teeth, and cilia, with numerous prominent reticulate veins; lower leaves basally often tapering, middle and upper leaves round at base, sessile, semiamplexicaul. Capitula solitary or less numerous, 2.5–7.0 cm wide. Involucre 1.5–1.8 cm wide; outer involucral bracts lanceolate, 1.0–1.2 cm long, 1.2–1.5 mm wide, erect, herbaceous, densely hairy, acute; inner bracts linear-lanceolate or linear, 1 cm long, 0.7–1.0 mm wide, acuminate, scarious, glabrous only in upper part, hairy along margin. Florets with golden-yellow smooth corolla; ligules linear 1 cm long, three- to six-veined, three-toothed; tubular florets 5–6 mm long, as long as or slightly longer than pappus, with five acute smooth teeth. Achenes longitudinally ribbed, 2 mm long, glabrous, brown; pappus two to two and one-half times as long as achenes, of numerous (27) dirty-white bristles. Flowering VI.

Larch and rarely pine forests, edges, scrubs; feathergrass-forb, feathergrass-sheep's fescue, and meadow steppes; steppe and calcareous slopes, sometimes as weed. —*European Part*: Karelia-Lapland (Khibiny station, introduced plant), Upper Volga, Volga-Kama, Upper Dnieper, Middle Dnieper, Volga-Don, Trans-Volga, Upper Dniester, Bessarabia, Black Sea Region, Lower Don; *Caucasus*: Ciscaucasia; *Western Siberia*: Ob Region, Upper Tobol (western Part), Irtysh. *General distribtution*: Central Europe, Atlantic Europe, Mediterranean (west), Balkans-Asia Minor. Described from Europe. Type in London.

Series 4. Ensifoliae Gorschk. Leaves narrowly linear-lanceolate or linear-oblong, appressed above, sessile, with five to seven parallel veins; outer involucral bracts broadly lanceolate, slightly longer than linear-lanceolate inner bracts.

8. **I. ensifolia** L. Sp. pl. (1753) 883; M.B. Fl. taur.-cauc. II, 320; DC. Prodr. V, 466; Ldb. Fl. Ross. II, 504; Boiss. Fl. or. III, 190; Beck, l. c., 450 36; Schmalh. Fl. II, 51; Grossh. Fl. Kavk. IV, 107; O. and B. Fedtsch. Perech. Rast. Turk. IV, 171; Klokov in Vizn. Rosl. URSR, 528, 529; Kirpiczn. in Majevsk. Fl., Izd. 8, 571. —*Aster ensifolius* Scop. Fl. carn. ed. 2, II (1772) 174. —*Inula hybrida* Baumg. Enum. Stirp. Trans. III (1816) 132; Schmalh. Fl. II, 50. —**Ic.**: Rchb. Ic. Fl. Germ. XXVI, tab. 928; Hegi, Ill. Fl. VI, 1, 48, Fig. 244, e–k; Geideman, Opredel. Rast. Moldavsk SSR, Fig. 33. —**Exs.**: Fl. exs. Austro-Hung, No. 246; Fl. exs. Reip. Boh. Sloven. No. 75; Pl. Hercegov, exs. No. 199; Fl. Ital. exs. Nos. 681, 1783; Herb. norm. No. 2647.

Perennial. Plant glabrous, 15–30(45) cm high. Rhizome horizontal, creeping, branched; stem slender, erect or slightly bent, longitudinally ribbed, simple or sometimes branched in upper part and reddish. Leaves numerous, dense, narrowly linear-lanceolate, 3.5–7.0(9) cm long, 3–4(6) mm wide, appressed above, obtuse, with five to seven parallel prominent veins, glabrous, along margin covered with long white multicellular hairs sessile on small tubercles, basally somewhat narrowed, sessile; floral leaves similar, 1.5–2.0 cm long, 1.0–1.5 mm wide. Capitula solitary (very rarely two to four), 2.5–4.0(4.5) cm wide, terminal. Involucre 1.5–1.8(2.3) cm wide, three-rowed, imbricate; involucral bracts appressed or in upper part somewhat squarrose; outer bracts coriaceous, broadly lanceolate, 1 cm long, 3 mm wide, slightly longer than inner ones, three-veined, along midrib white-pubescent, along margin narrowly dark red, densely pilose; middle bracts lanceolate or spatulate, 8 mm long, 2 mm wide, slightly shorter than inner bracts, at base coriaceous, with one pilose vein, along margin also with dark red stripe, densely short-ciliate, inner bracts linear-lanceolate, 9 mm long and 2 mm wide, in lower part membranous, in upper part reddish, along margin densely short-ciliate. Ligulate florets yellow, 1.5–1.7 cm long, one and one-half to two times as long as involucral bracts, sparsely glandular outside with small glands, with filiform, 5–7 mm long tube, slightly shorter than pappus, ligules linear, 1 cm long and 1 mm wide, recurved, three- or four-veined, three-toothed, teeth equal; tubular florets 6–7 mm long, 1 mm wide, sparsely glandular, in upper part yellow, as long or slightly longer than pappus, five-toothed, teeth equal, acute. Achenes linear-oblong, 2 mm long, 0.5 mm wide, smooth, brown, longitudinally ribbed; pappus three times as long as achenes, with many (30) bristles. Flowering VI–VIII.

Mountain (1,250–1,300) m chalky and calcareous slopes and outcrops, oak broad-leaved, beech, pine, and juniper forests on mountain slopes and grass-forb steppes. —*European Part*: Upper Dnieper, Middle Dnieper, Volga-Don, Upper Dniester, (Trans-Carpathian Province), Bessarabia, Black Sea Region, Crimea, Lower Don; *Caucasus*: Ciscaucasia, Dagestan, western Transcaucasia. *General distribution*: Central Europe, Mediterranean (western and northern Italy), Balkans-Asia Minor. Described from Austria. Type in London.

451 *Series* 5. Germanicae Gorschk. Capitula 0.7–1.0 cm wide, numerous, in dense corymb; involucre 5–7 mm wide, outer involucral bracts ovate or ovate-triangular, half to two-thirds as long as linear inner bracts.

9. **I. germanica** L. Sp. pl. (1753) 883; M.B. Fl. taur.-cauc. II, 320 and III, 576; DC. Prodr. V, 467; Ldb. Fl. Ross. II, 505; Boiss. Fl. or. III, 189; Schmalh. Fl. II, 49; O. and B. Fedtsch. Perech. Rast. Turk. IV, 171; Grossh. Fl. Kavk. IV, 106; Klokov in Vizn. Rosl. URSR, 529; Kirpiczn. in Majevsk. Fl., Izd. 8, 570. —*I. germanica* β. *latifolia* Schur. in Oest. botan. Zeitschr. (1861) 92. —*I. germanica* α. *normalis* Beck and γ. *caucasica* Beck, Inulae Eur. (1881) 18. —*I. fasciculata* Gilib. Fl. Lithuan. III (1781) 209 and Exerc. phytol. I (1792) 171. —*I. orientalis* Willd. Sp. pl. III, 3 (1800) 2100, non Lam.—*I. micranthos* Poir. in Lam. Encycl. suppl. III (1813) 153.—*I. media* M.B. Fl. taur.-cauc. III (1819) 575. —*Pulicaria germanica* Presl. Fl. čech. (1819) 178. —**Ic.**: J. Gmelin, Fl. Sibir. II, tab. 78, fig. 1; Rchb., Ic. Fl. Germ. XVI, tab. 931; Hegi, Illustr. Fl. VI, l, 478, Fig. 242, a–c. —**Exs.**: Herb. norm. No. 76; Fl. Gall. et Germ. exs. No. 1227; Fl. exs. Austro-Hung. No. 244.

Perennial. Plant 30–60 cm high, lanate-villous (except corolla of ligulate and tubular florets, ovary, and achene), densely covered with long white fine hairs and scattered, punctate, small golden glands. Rhizome horizontal, creeping, cylindrical, branched, scaly; stem ascending, erect, or arched, longitudinally ribbed, at base scaly, branched above. Leaves oblong, oblong-lanceolate, or elliptical, 4.5–8.0(10) cm long, 1.1–2.5(3) cm wide, stiff, all leaves abruptly short-pointed, sessile, at base broadly cordate, semiamplexicaul, entire or sparsely toothed, spinescent, with prominent veins beneath, on both sides glandular-hairy. Capitula numerous, 0.7–1.0 cm wide, on 1 cm long peduncles, in dense corymb. Involucre 5–7 mm wide; outer involucral bracts ovate, 3 mm long, 2 mm wide, in upper part green, middle bracts lanceolate, 5 mm long, 1 mm wide, all acute, recurved, inner bracts scaly, narrowly linear, 5–6 mm long, 0.5–0.7 mm wide, acute, all appressed glandular-hairy on outer side, ciliate. Ligulate florets yellow, 0.8–1.1 cm long, one and one-half times as long as involucral bracts, with 5 mm long tube, as long as pappus, ligules linear, 4–5 mm long, 1 mm wide, three-veined, three-toothed, glandular outside; central florets tubular, 6 mm long, slightly longer than pappus, five-toothed, teeth acute, in lower part glandular. Achenes glabrous, longitudinally ribbed, brown, 1.5 mm long, 0.3 mm wide, pappus three times as long as achenes. Flowering VI–VIII.

452 Steppe, rarely forest-steppe regions, sheep's fescue- and forb-feathergrass, feathergrass, and grass-forb steppes; forest-steppe and steppe slopes; edges, scrubs and cut-over areas; on calcarous soils among scrubs, sometimes as a weed. —*European Part*: Volga-Kama, Upper Dnieper, Middle Dnieper, Volga-Don, Trans-Volga, Bessarabia, Black Sea Region, Crimea, Lower Don, Lower Volga; *Caucasus*: Ciscaucasia, Dagestan, western, eastern and southern Transcaucasia, Talysh; *Western Siberia*: Upper Tobol (Ilek District, Orenburg, Troitsk, Aktyubinsk Region, Mugodzhary); *Soviet Central Asia*: Aralo-Caspian. *General distribution*: Central Europe (Germany), Balkans-Asia Minor, Armenia and Kurdistan. Described from Germany. Type in London.

Note. Distributed in the Orlov, Poltava, Podolsk regions and the Moldavian SSR, *I. media* M.B. Fl., taur.-cauc. III (1819) 576 is a hybrid between *I. germanica* L. × *I. salicina* L., distinguished from the first species by having glabrous leaves and fewer capitula. *I. hybrida* Baumg, *Enum. Fl. Transsylv.* III (1816) 132, named from the Stalingrad Region, is a hybrid of *I. germanica* L. × *I. ensifolia* L. (Beck, l. c., 32).

Series 6. Salicinae Gorschk. Capitula 1–4 cm wide, usually numerous, in lax corymbs; involucre 0.7–2.3 cm wide, outer bracts oblong, lanceolate, or ovate-lanceolate, with rhombic, oblong-ovate or round-spatulate apex, usually two-thirds as long as inner linear bracts.

10. **I. aspera** Poir. in Lam. Encycl. suppl. III (1813) 154; Krashenin in Fl. Yugo-Vost. VI, 328; Klokov in Vizn. Rosl. URSR, 529, 530; Kirpiczn. in Majevsk. Fl., Izd. 8, 572. —*I. salicina* var. *latifolia* DC. Prodr. V (1836) 466. —*I. salicina* β. *aspera* (poir.) Beck, Inulae Eur. (1881) 22. —*I. salicina* β. *aspera* 1. *latifolia* and 2. *angustifolia* Beck, l. c. 22, 23. —*I. bubonium* M.B. Fl. taur.-cauc. II (1808) 320, non Jacq. —*I. bubonium* Jacq. in C.A.M. Verz. Pfl. cauc-casp. (1831) 178. —*I. squarrosa* Griseb. Iter. hung. (1832) 337, non L. nec Koch. —*I. cordata* auct. non Boiss.: Schmalh. Fl. II, 51; Grossh. Fl. Kavk. IV, 107; Krylov, Fl. Zap. Sib. XI, 2709. —*I. squarrosa* Ldb. Fl. Ross. II (1845–1846) 503 non L. —*I. spiraeifolia* C. Koch ex Boiss. Fl. or. III (1875) 188, non L.: O. and B. Fedtsch. Perech. Rast. Turk. IV, 171; Fedtsch. Rast. Turk., 734. —**Ic.**: Fl. Yugo-Vost. VI, Fig. 671. —**Exs.**: Fl. exs. Austro-Hung. No. 3801 and No. 3802; Pl. Hercegov. exs. No. 201.

Perennial. Plant 30–50(75) cm high. Rhizome horizontal, short, slender, 3 mm thick; stem longitudinally ribbed, erect, sometimes in upper part weakly branched, glabrous or covered with stiff, white, multicellular, upright hairs, sessile on tubercles, densely leafy. Leaves more or less appressed toward stem, oblong or oblong-lanceolate, 2.0–4.5(5) cm long, (0.6)0.8–1.2(2.5) cm wide; leaves on peduncles lanceolate, 2.5 cm long, 0.5 cm wide, all leaves coriaceous, short-acuminate or more or less subobtuse, usually 453 sessile, at base cordate, auriculate, usually amplexicaul, entire or indistinctly small-toothed with numerous fine short recurved spinules, glabrous or usually on both sides covered with occasional stiff hairs, with prominent veins. Capitula 1–3 cm wide, numerous (two to seven), rarely solitary, 5 cm long, in lax corymbs. Involucre 1.0–1.5 cm wide, many-rowed, imbricate, involucral bracts reddish in upper part; outer bracts oblong, 5–7 mm long, 2.5 mm wide, with broadly round-spatulate herbaceous apex, glabrous or covered with occasional hairs, densely ciliate and usually recurved; inner bracts linear, 0.7–1.1 cm long, 1.0–1.3 mm wide, one and one-half times as long as outer, scaly, acute, glabrous, ciliate. Florets yellow; ligulate florets 1.3–2.0 cm long, one and one-half to two times as long as involucre, glabrous, with 5–7 mm long and 0.2 mm wide tube, somewhat shorter than pappus, ligules linear, 0.8–1.3 cm long, 1 mm wide, with four reddish veins, three-toothed; tubular florets obconical, 8 mm long, 0.7 mm wide, glabrous, slightly longer than pappus, five-toothed. Achenes linear-oblong, 1.3 mm long, 0.2 mm wide, glabrous; pappus 6–7 mm long, of numerous white bristles. Flowering VI–VII. (Plate XXVII, Fig. 2).

Steppe and semidesert zones, feathergrass, feathergrass-forb and shrubby alkaline steppes, steppe and meadow slopes, in grass-forb and steppe, alkaline meadows, on chalks and sands, slopes and trails of steppe hills and mountains; rarely penetrating forest-steppe zone, where it occurs in broad leaved forests with pines, birch-aspen and hornbean forests.—*European Part*: Volga-Kama (southern part), Middle Dnieper, Volga-Don, Trans-Volga, Bessarabia, Black Sea Region, Crimea, Lower Don, Lower Volga (northern part); *Caucasus*: Ciscaucasia, Dagestan, western, eastern, and southern Transcaucasia; Talysh; *Western Siberia*: Upper Tobol, Irtysh, Altai; *Soviet Central Asia*: Aralo-Caspian, Syr-Darya, Balkhash Region, Pamiro-Alai, Tien Shan, mountainous Turkmenia (Geoktepe Region), Dzhungaria-Tarbagatai (the Lepsa River in the Alatau Range). *General distribution*: Balkans-Asia Minor, Armenia and Kurdistan, Iran. Described from the Botanic Garden, Paris. Type in Paris.

Economic Importance. According to one set of data, this plant contains 50 mg% of vitamin C during the flowering stage (Larin et al., *Kormov. Rast. Senokos. i Pastb.*, 444, after Kloptov), and according to another set (Larin et al., ibid. 444, after Maleev)—84 mg% of vitamin C.

11. **I. sabuletorum** Czern. ex Lavr. in Addenda in Index semin. Hort. Bot. Charjkov. (1925–1926) 7. —Krashenin in Fl. Yugo-Vost. Evrop. Ch. SSSR, VI, 325, 328; Klokov in Vizn. Rosl. URSR, 529, 530; Kirpiczn. in Majevsk. Fl., Izd. 8, 572. —*I. cordata* Pacz. in Izv. Gos. Stepn. Zapov. Askaniya-Nova I (1922) 112 etc. nom. nud. non Boiss. —*I. schmalhausenii* Pacz. in Izv. Gos. Stepn. Zapov. Askaniya-Nova II (1923) 58, 60 etc. nom. nud. non Winkl.

454 Perennial. Plant 30–60 cm high. Rhizome creeping, long; stem longitudinally ribbed, erect, branched from middle, glabrous or covered with white multicellular, occasional, upright hairs, sessile on tubercles; branches often numerous, long. Cauline leaves narrowly-linear, 5–9 cm long, 0.5–1.2 cm wide; leaves of lateral branches linear-lanceolate, 2.0–2.5 cm long, 2.0–2.4 mm wide; all leaves coriaceous, long-acuminate, sessile, basally cordate, semiamplexicaul, auriculate, on both sides with prominent veins, covered with scattered white hairs on tubercles. Capitula 3 cm wide, usually many (3–12), rarely solitary, on sparsely pubescent peduncles, (2)4–8 cm long, in lax corymbs. Involucre 0.7–2.0 cm wide; involucral bracts reddish in upper part; outer bracts oblong-ovate, 7 mm long, 2.5–2.8 mm wide, with ovate, herbaceous, glabrous acute apex, more or less recurved; middle bracts lanceolate, almost as long as outer but much narrower, 1.8 mm wide and like latter glabrous and recurved; inner bracts narrow-linear or subulate, 1 cm long, 1 mm wide, in upper part appressed, puberulent, erect like middle bracts, apiculate; all bracts densely ciliate. Florets yellow, ligulate, 1.6–1.9 cm long, one and one-half to two times as long as involucre, glabrous, with 6–7 mm long tube, somewhat shorter than pappus, ligules linear, 0.9–1.1 cm long, 1 mm wide, three-toothed and with three prominent veins; tubular florets glabrous, as long as pappus or somewhat longer. Achenes linear-oblong, brown, 2 mm long, 0.2 mm wide, longitudinally ribbed, glabrous; pappus white, 3–4 times as long as achenes, of numerous bristles. Flowering VI–VIII. (Plate XXVII, Fig. 1).

Sand mounds, sandy depressions, aspen groves, bottomlands and wet meadows. —*European Part*: Black Sea Region, Lower Don, Lower Volga: *Soviet Central Asia*: Aralo-Caspian, Balkhash Region, Tien Shan. Described from the vicinity of Izyum. Type in Kiev.

Note. It is distinguished from the steppe species *I. aspera* Poir. by the long rhizome, highly branched stem, more narrowly lanceolate leaves, and its confinement largely to sands.

12. **I. salicina** L. Sp. pl. (1753) 822; Turcz. Fl. baic.-dah. II, 28; Ldb. Fl. alt. IV, 93; DC. Prodr. V, 466; Ldb. Fl. Ross. II, 504; Boiss. Fl. or. III, 187; Beck l. c. 21; Schmalh. Fl. II, 50; Kom. Fl. Manchzh. III, 622; O. and B. Fedtsch. Perech. Rast. Turk. IV, 171; Kom. and Alis. Opredel.

Rast. Dalnevost Kr. II, 1024; Grossh. Fl. Kavk. IV, 107; Krylov. Fl. Zap.
Sib,. XI, 2709; Klokov in Vizn. Rosl. URSR, 529; Kirpiczn. in Majevsk. Fl.
Izd. 8, 572. —*I. glabra* Gilib. Fl. Lithuan. III (1781) 208 and Exerc. Phytolog.
(1792) 170. —*Aster salicinus* Scop. Fl. carn. ed. 2, II (1772) 172. —*Conyza
salicina* Rupr. Fl. Ingr. (1860) 568. —**Ic.**: J.G. Gmel. Fl. Sib. II, tab. 77; Rchb.
Ic. Fl. Germ. XIV, tab. 298; Syreistsch. Ill. Fl. Mosk. Gub. III, 250; Hegi.
Ill. Fl. VI, 1, tab. 262, 1-1d and 480, fig. 243; Fl. Yugo-Vost., No. VI, Fig.
455 671; —**Exs.**: GRF No. 418; Fl. Exs. Reip. Boh. Sloven. No. 1183; Pl. Finl. exs.
Nos. 1382 and 1383; Fl. exs. Austro-Hung. No. 3800; Fl. Bohem. et Morav.
exs. No. 794.

Perennial. Plant 30–70 cm high, glabrous or somewhat asperate-hairy (var. *hirtula* Schmalh.). Rhizome slender, creeping, branched; stem ascending, erect, longitudinally sulcate, glabrous or, sometimes, in lower part, pubescent, with mostly scattered hairs, simple or weakly branched above. Leaves numerous, more or less coriaceous, lustrous, glabrous, divergent with prominent veins beneath, covered with short scattered bristles, entire or with occasional teeth and dense spinules along margin; lower leaves ovate or oblong-ovate, (2.5)6–10 cm long, (1)2–3 cm wide, in upper part round, basally tapering; middle and upper leaves oblong or oblong-lanceolate, 5 cm long, 1.5 cm wide, or narrowly lanceolate, 5 cm long, 0.8 cm wide (var. *angustifolia* Schmalh.), acuminate, sessile, at base cordate, semiamplexicaul, auriculate. Capitula 2.5–4.0 cm wide, on 2–5 cm long peduncles, solitary or in groups of two to five in corymbs. Involucre 1.2–1.4 cm wide, involucral bracts glabrous, ciliate, reddish-purple in upper part; outer bracts lanceolate or ovate-lanceolate, 7 mm long, 2.0–2.5 mm wide, with rhombic or oblong-ovate, green tip, narrowed toward base, long-acuminate and recurved; inner bracts linear, 1 cm long, 0.8–1.0 mm wide, somewhat (by one-third) longer than outer, acute, sometimes appressed hairy in upper part; ligulate florets yellow, glabrous, 1.3–1.5 cm long, one and one-half times as long as involucral bracts, with 5–6 mm long tube, slightly shorter than pappus, ligules linear, 8 mm long and 1.0–1.5 mm wide, three- to five-veined, three-toothed; tubular florets five-toothed, as long as pappus. Achenes oblong, 1.5–2.0 mm long, 0.2 mm wide, glabrous, brown, finely ribbed; pappus 7–8 mm long. Flowering VI–VIII.

Steppe, forest steppe, and southern part of forest regions; pine and larch forests, edges, scrubs, forest, forest-steppe, steppe and alkaline [*solonetz*] meadows, forb- and sheep's fescue-feathergrass steppes, on chalky outcrops and banks of rivers and lakes, sometimes as weed in fallow lands. —*European Part*: Karelia-Lapland, Dvina-Pechora, Baltic Region, Ladoga-Ilmen, Upper Volga, Volga-Kama, Upper Dnieper, Middle Dnieper, Volga-Don, Trans-Volga, Upper Dniester, Bessarabia, Black Sea Region, Crimea, Lower Don, Lower Volga; *Caucasus*: Ciscaucasia;

Western Siberia: Ob Region, Upper Tobol, Irtysh, Altai; *Eastern Siberia*: Yenisei, Lena-Kolyma, Angara-Sayans, Dauria; *Far East*: Zeya-Bureya, Ussuri; *Soviet Central Asia*: Aralo-Caspian, Balkhash Region, mountainous Turkmenia, Pamiro-Alai, Tien Shan (near Ketmen-Tyube). *General distribution*: Scandinavia, Central Europe, Atlantic Europe, Mediterranean, Balkans-Asia Minor, Iran, Dzhungaria-Kashgaria, Japan, China. Described from northern Europe. Type in London.

Economic Importance. Its leaves are used for medicinal purposes (Zemlinsk. *Lekarstv. Rast. SSSR*, Ed. 2, 101).

456 *Note.* A commonly found form with a hairy stem and leaves in the lower part (*Inula subhirta* C.A.M.) is a hybrid between *I. hirta* L. and *I. salicina* L. (Majevsk. Fl. Ed. 8, 572).

13. **I. kitamurana** Tatew. ex Honda Nom. Pl. Jap. (1939) 360. — *I. salicina* var. *asiatica* Kitam. in Acta Phytotax. et Geobot. II (1933) 44. —*I. salicina* subsp. *asiatica* (Kitam.) Kitag. Lineamen Fl. Manshur. (1939) 453. —*I. salicina* var. *genuina* Fr. and Sav. Enum. Pl. Jap. II (1879) 401, non L. —*I. salicina* var. *latifolia* Fr. and Sav. ibid. 401. —*I. involucrata* Miq. in Ann. Mus. Bot. Lugd.-Batav. II (1866) 171, non Kalenic. p. p. —**Ic.**: Sugawara, Ill. Fl. Saghal. IV, tab. 821.

Perennial. Plant about 35 cm high, covered with scattered, erect, white multicellular hairs on fine tubercles (except on outer involucral bracts, ligulate and tubular florets, ovary and achene) and sometimes with scattered, golden, fine, round sessile glands. Stem terete, longitudinally finely sulcate, densely pubescent, erect, simple. Leaves numerous, oblong-lanceolate, 4.0–6.5 cm long, 1.0–1.4 cm wide; upper leaves 2 cm long, 0.5 cm wide, lanceolate, floral leaves 4 cm long, 0.5 cm wide, all leaves acute, sessile, semiamplexicaul, with obtuse auricles, with prominent veins particularly beneath, along margin with scattered oblique brown crenations, denticles and white cilia on tubercles. Capitula usually solitary, 4 cm wide. Involucre 2.3 cm wide, involucral bracts purple in upper part and along margin densely ciliolate; outer bracts oblong-lanceolate, 8–9 mm long, 2 mm wide, with rhombic, acute, recurved apex, basally narrowed; middle bracts oblong-lanceolate, almost as long as outer, 1.3 mm wide, with green acute apex; inner bracts linear, 1 cm long, 0.5–1.0 mm wide, acute, recurved, like middle bracts pubescent in upper part with appressed hairs. Ligulate florets 1.8 cm long, two times as long as involucral bracts, with 6 mm long tube, reddish below, slightly shorter than pappus, ligules 1.2 cm long, 0.8 mm wide, with three or four reddish veins, three-toothed; tubular florets 8 mm long, longer than pappus, in lower part more or less reddish, five-toothed. Achenes 1.5–2.0 mm long, 0.2 mm wide, brown, cylindrical, longitudinally finely ribbed, glabrous; pappus 7 mm long, of numerous (32) white bristles. Flowering VII.

Far East: Sakhalin. *General distribution*: Japan. Described from Hondo Island. Type in Kyoto.

Group 2. **Lasiocarpae** Boiss. Fl. or. III (1875) 185. Ovary and achenes usually more or less hirsute; pappus of many bristles.

Series 7. Montbretianae Gorschk. Capitula 4–5(6) cm wide; involu-
457 cre 1.7–3.5 cm wide, outer involucral bracts ovate-oblong or ovate lanceolate, almost equal to or somewhat shorter than the more or less subulate inner bracts.

14. **I. montbretiana** DC. Prodr. VII (1838) 284; Boiss. Fl. Or. III, 193; Grossh., Fl. Kavk. IV, 108. —**Exs.**: Pl. exs. Anat. or. No. 1131.

Perennial. Whole plant sericeous-velutinous, 10–25 cm high, densely covered with long, multicellular, appressed white hairs. Stem erect or slightly bent, simple, indistinctly sulcate. Basal leaves numerous, lanceolate or lanceolate-spatulate, 7–9 cm long, 0.6–1.0 cm wide, obtuse, basally narrowed into 3 cm long petiole; cauline leaves linear-lanceolate, acute, 3–8 cm long, 0.3–0.5 cm wide, tapering toward base, sessile; all leaves entire. Capitula solitary, (2)3–4 cm wide. Involucre 1.7–2.5 cm wide, with many bracts, many-rowed, imbricate; outer bracts ovate-oblong, 7 mm long, 2–3 mm wide, densely long-pubescent, acute; middle bracts linear-lanceolate, 0.9–1.0 cm long, 1 mm wide, acute, densely hairy in middle and above; inner bracts narrowly linear, almost filiform, 1.1–1.2 cm long, 0.5–0.7 mm wide, acute, glabrous, all bracts densely ciliate, reddish in upper part and along margin. Ligulate florets 1.8–2.0 cm long, two times as long as involucral bracts, yellow, with 7 mm long tube, slightly shorter than pappus, ligules linear, 1.3 cm long, 1.0–1.5 cm wide, five-veined, on outer side covered with scattered long hairs and numerous fine golden glands, three-toothed; disk florets obconical, 7–8 mm long, as long as or shorter than pappus, five-toothed, teeth sparsely glandular on outer side. Achenes linear-oblong, 3 mm long, 0.2 mm wide, brown, covered with short white hairs upward appressed; pappus three times as long as achenes, of numerous bristles. Flowering VI–VIII.

Mountains at an altitude of 1,900 m, subalpine zone, dry steppe slopes. —*Caucasus*: Southern Transcaucasia. *General distribution*: Balkans-Asia Minor, Armenia and Kurdistan. Described from Cappadocia. Type in Geneva.

15. **I. mariae** Bordz. in Zap. Kievsk. Obshch. Estestvoispyt. XXV (1915) 115; Grossh. Fl. Kavk. 108. —**Ic.**: Bordz. op. cit. Fig. 9; Fl. Gruzii, VIII, Plate 387. —**Exs.**: Pl. orient. exs. No. 199.

Perennial. Plant 19–35 cm high, densely pubescent throughout with soft, multicellular, 2 mm long hairs; root oblique or creeping, short-branched. Stem simple, erect. Leaves green, sparsely toothed and with occasional fine glands; lower leaves oblong-spatulate, 7–16 cm long, 2.0–2.8 cm wide, with 4–7 cm long winged petiole; upper leaves ovate-oblong, 7 cm long, 2.2 cm wide, basally cordate, amplexicaul, sessile, with wide obliquely adnate auricles. Capitula 4–5(6) cm wide, two to four, rarely solitary, on dense white-pilose, somewhat inclined, 2–9 cm
458 long peduncles, aggregated in corymbs. Involucre 2.5–3.5 cm wide, many-rowed; outer bracts green, ovate-lanceolate, mucronate, 1.3–1.5 cm long, 4.0–7.5 mm wide, basally narrowed, pale, coriaceous, covered with long white hairs; middle bracts gradually becoming narrower, lanceolate, 1.2–1.5 cm long, 1.5–2.0 mm wide, long-acuminate, covered with erect, brown hairs; inner bracts narrowly linear, 1.5 cm long, 0.5–1.0 mm wide, thin coriaceous, at apex herbaceous, basally covered with short, but in upper part and at apex, with long brown hairs. Ligulate florets yellow, 2.0–2.8 cm long, almost two times as long as involucral bracts, with 0.8 cm long tube, almost as long as pappus, ligules linear, 1.0–1.8 cm long, 2 mm wide, five- or six-veined, on outer side covered with long scattered hairs and fine golden glands, three-toothed, teeth 1–4 mm long, covered with fine sessile glands; tubular florets 7 mm long, slightly shorter or as long as pappus, with acute teeth, glandular outside. Achenes linear-oblong, brown, longitudinally ribbed, covered with short upturned hairs, 2.5–3.0 mm long, 0.2 mm broad; pappus 6–8 mm long, of numerous (up to 45) bristles. Flowering VII–VIII.

Mountains, in subalpine zone, meadows and stony talus. —*Caucasus:* Western Transcaucasia (former Artvin District, Yaila-Khod), eastern (Akhalkalaki District) and southern Transcaucasia. Endemic. Described from Akhalkalaki District (Bol shoi Abul Mountain). Type in Kiev?

Series 8. Glaucae Gorschk. Capitula 3–5 cm wide; involucre 2.0–3.5 cm wide; outer bracts lanceolate, inner ones linear or subulate; corolla of ligulate florets pubescent on outer side.

16. **I. glauca** Winkl. in Tr. Peterb. Bot. Sada, XI, No. II (1890) 275; O. and B. Fedtsch. Perech. Rast. Turk. IV, 172.

Perennial. Plant 15–30 cm high, covered with white multicellular, 1–2 mm long, hairs on fine tubercles (except tubular florets) and with golden, fine, elliptical glands on short white stalks (except ovary and achene). Rhizome woody, usually thick, 1.2 cm wide; stems two to five, cylindrical, simple or sometimes branched. Leaves bluish-green, oblong-ovate, usually spatulate, 3.5–5.5 cm long, 1.0–3.5 cm wide, sessile, basally cordate, obtuse; middle leaves amplexicaul, auriculate, auricles obtuse; floral leaves 1.0–1.5 cm long, 0.4 mm wide. Capitula one or two, rarely four, terminal, 3–4 cm wide. Involucre 2.0–2.5 cm wide; involucral bracts usually equal, 1 cm long, acute, one-veined; outer bracts lanceolate, 1.3–1.5 mm wide, green, pilose; middle bracts linear-lanceolate, 1 mm wide, coriaceous, yellowish, glabrous, in upper part green or 459 reddish, covered with long, white, simple hairs, ciliate; inner bracts linear, 0.5–0.8 mm wide, coriaceous, smooth, at apex reddish and appressed hairs. Florets yellow, ligulate 1.5–1.7 cm long, on outer side, particularly in middle, glandular-hairy, with 5 mm long tube, as long as pappus, neck appressed hairy, ligules linear 1.3 cm long, 1 mm wide, divergent, with three reddish veins, three-toothed; tubular florets 8 mm long, slightly longer than pappus, glabrous, five-toothed, teeth glandular outside. Achenes cylindrical, 2 mm long, 0.8 mm wide, covered with white appressed hairs; pappus 5–6 mm long, of 16–18 bristles. Flowering VI–IX. (Plate XXVIII, Fig. 3).

Mountains at 1,800–1,900 m, on slopes with forest vegetation, rocks and ravines. —*Soviet Central Asia:* Pamiro-Alai. Endemic. Described from Darvaz, Khumbov, a tributary of the Pyandzh River (near Kala-i-Khum). Type in Leningrad.

Note. Winkler erroneously mentions that the tubular florets of this species are pubescent; they are glabrous.

17. **I. schmalhausenii** Winkl. in Tr. Peterb. Bot. Sada, IX, 2 (1886) 420; O. and B. Fedtsch. Perech. Rast. Turk., IV, 172.

Perennial. Plant 6–30 cm high, throughout (excluding inner involucral bracts and tubular florets) lanate, covered with short as well as long, white, multicellular, fine hairs on fine tuburcles. Stem ascending or erect. Leaves ovate-lanceolate, almost spatulate; upper leaves (2.5)4.5–6.0(7.0) cm long, (1.2)1.4–2.3(3.0) cm wide, semiamplexicaul, auriculate, auricles obtuse; lower leaves without auricles, 3.5–6.0 cm long, (1.0)1.3–2.3 cm broad, tapering into 1–2(2.5) cm long petiole, all leaves rugose, with prominent reticulate veins and sparsely long pilose beneath, puberulent above, undivided or with irregular small teeth, ciliate, usually apically cartilaginous; acute; floral leaves 1.7–2.0 cm long, 0.6 cm broad, like upper leaves. Capitula solitary, terminal, 4–5 cm wide. Involucre 3.5 cm wide, two- or three-rowed, involucral bracts equal or inner bracts somewhat shorter, one-veined; outer bracts lanceolate, herbaceous, green, 1.1–1.5 cm long, 1.5–2.0 mm wide, pubescent, acute, recurved in upper part; middle bracts linear-lanceolate, 0.8–1.1 cm wide, in lower part coriaceous, yellowish, glabrous, in upper part herbaceous, pubescent, acute; inner bracts linear, almost subulate, 0.3–0.5 mm wide, glabrous, mucronate, all bracts ciliate. Florets yellow, ligulate 1.4–2.3 cm long, covered with long, erect, white, appressed hairs on the outside, with 5–

7 mm long tube, almost as long as pappus, ligules linear, 2–3 times as long as corolla tube, three-toothed, four- or five-veined; central [disk] florets tubular, 0.9–1.0 cm long, slightly longer than pappus, glabrous, five-toothed, teeth equal, sparsely glandular-hairy on the outside. Achenes 460 linear, 2–3 mm long, 0.5 mm wide, covered with upward appressed white hairs; pappus 2–3 times as long as achenes. Flowering VII.

Mountains, ravines and rock crevices to 2,600–2,800 m. —*Soviet Central Asia:* Pamiro-Alai. Endemic. Described from Altyn-Mazar. Type in Leningrad.

Series 9. Caspicae Gorschk. Capitula 2–4 cm wide, in corymbs; involucral bracts 1.0–2.3 cm wide, outer bracts lanceolate-linear, 1.0–1.3 mm wide, slightly shorter than narrowly linear inner bracts.

18. **I. caspica** Blum in Ldb. Ind. Sem. Hort. Ac. Dorpat. (1822) 10; DC. Prodr. V, 467; Schmalh. Fl. II, 52. —*I. caspica* Ldb. Fl. Ross. II (1845–1846) 507; Trautv. in Bull. Soc. Nat. Mosc. XXXIX, 1 (1866) 344; Boiss. Fl. or. III, 194; Beck l. c. 40; O. and B. Fedtsch. Perech. Rast. Turk. IV, 172; Grossh. Fl. Kavk. IV, 108; Krylov, Fl. Zap. Sib. XI, 2712. —*I. euxina* Sosn. in Zhurn. Russk. Bot. O-va. 14, 1 (1929) 81.

Biennial. Plant bluish-green, 30–50(65) cm high. Stem usually solitary, sometimes several, at base woody, smooth, more or less reddish or more or less asperate (var. *scaberrima* Trautv.), in upper part usually covered with erect white hairs, finely ribbed, erect, rarely cymosely branched, branches virgate. Lower leaves narrow-oblong or lanceolate, 7–17 cm long, 0.8–2.5 cm wide, on about 1 cm long petiole, other leaves linear-lanceolate, up to 10 cm long, 0.6 cm wide, sessile, almost auriculate, at base slightly cordate, semiamplexicaul; upper leaves linear, 5–6 cm long, 0.5 cm wide, acute, with prominent midrib beneath, entire, glabrous, sometimes along margin and beneath covered with fine stiff bristles on tubercles (var. *scaberrima* Trautv.). Capitula 2.0–3.5 cm wide, numerous, on (0.3)1.5–4.0(6.0) cm long peduncles, densely covered with stiff bristles on tubercles and white, long, multicellular hairs, aggregated in lax corymbose inflorescence. Involucre 1.5–2.0 cm wide; outer involucral bracts lanceolate-linear or linear, 0.5–0.6(0.8) cm long, 1.0–1.3 mm wide, coriaceous; inner bracts scaly, narrowly linear, 0.7–1.0 cm long, 1 mm wide, acute, along margin covered with short, stiff, erect cilia on tubercles, one-veined, sometimes reddish in upper part and recurved. Florets yellow, ligulate ones 0.9–1.0(1.4) cm long, one-third longer than involucral bracts, with 3–4 mm long tube, as long as pappus or slightly shorter; ligules linear, 7 mm long, 1 mm wide, recurved, three- or four-veined, covered with yellow sessile glands in lower part on outer side, three-toothed, teeth deltoid, equal, subobtuse; central [disk] florets 6 mm long, obconical, somewhat longer than pappus, five-toothed, teeth equal, acute, glandular outside. Achenes linear-oblong, 1.2–1.5 mm long, 0.5 mm wide, brown, ribbed, covered with white long upward appressed 461 hairs, three to four times as long as achenes; pappus of numerous (20–25) erect bristles. Flowering VII–VIII. (Plate XXVIII, Fig. 1).

Alkaline and saline sedge-grass meadows; among thick stands of reeds [*Phragmites*] and beach grass [*Calamagrostis*] in bottomlands; in mountains to middle zone; sometimes as weed. —*European Part*: Lower Volga; *Caucasus*: Ciscaucasia (floodplains of the Kuma River), Dagestan (floodplains of the Terek River), western Transcaucasia (near Anapa), eastern Transcaucasia (Sara Island), southern Transcaucasia (according to Grossheim), Talysh; *Western Siberia*: Irtysh, Upper Tobol, Altai (valleys of the Bukon, Bukhtarma and Kaldzhir rivers, near Aini-Bulak); *Soviet Central Asia*: Balkhash Region, Aralo-Caspian, Dzhungaria-Tarbagatai, Tien Shan, Kara-Kum, Kyzyl-Kum, Pamiro-Alai. *General distribution*: Iran (northern), Dzhungaria-Kashgaria (Kuldzha). Described from the Caspian Sea coast. Type in Leningrad.

19. **I. oculus-christi** L. Sp. pl. (1753) 881; M.B. Fl. taur.-cauc. II, 317 and III, 574; DC. Prodr. V, 465; Ldb. Fl. Ross. II, 502; Boiss. Fl. or. III, 192; Beck l. c. 41; Schmalh. Fl. II, 51; O. and B. Fedtsch. Perech. Rast. Turk. IV, 172; Grossh. Fl. Kavk. IV, 109; *I. suaveolens* Pall. Ind. Taur. ex M.B. Fl. taur.-cauc. II (1808) 317. —*I. montana* M.B. Fl. taur.-cauc. II (1808) 317 non L. —*I. campestris* Bess. Enum. Pl. Volhyn. (1822) 33 and 108. —*I. lanuginosa* Gilib. Fl. Lithuan. III (1781) 206; Ej. Exerc. Phytol. I (1792) 169. —**Ic.**: Rchb. Ic. Fl. Germ. XVI, tab. 924; Fl. Yugo-Vost. VI, Fig. 670; Hegi Ill. Fl. VI, 1, 484, fig. 245, g–k. —**Exs.**: Herb. norm. No. 2453; Fl. Graeca exs. Nos. 89 and 1146; Pl. Hercegov. exs. No. 200; Fl. exs. Austro-Hung. No. 1820; Fl. Cechoslov. exs. No. 93.

Perennial. Plant 25–50 cm high, densely covered with white, long, multicellular, appressed hairs; root 1–3 mm thick, creeping. Stem erect, longitudinally sulcate, sparingly branched above. Lower leaves oblong or oblong-elliptical, 12–14 cm long, 1.5–3.0 cm wide, subobtuse, on 5 cm long petiole; upper leaves lanceolate, 2.0–6.5(8.0) cm long, 1.0–2.5 cm wide, sessile, cordate (without auricles); leaves on peduncles 1 cm long, 0.5 cm wide. Capitula 3–4 cm wide, two to four (rarely solitary), in compact corymbs. Involucre 1.7–2.0(2.3) cm wide; outer involucral bracts lanceolate, 5–7 mm long, 1.1 mm wide, erect, acute, densely white-lanate; middle bracts linear-lanceolate, 7–8 mm long, 1 mm wide, inner linear, 1 cm long, 0.3–0.5 mm wide, all bracts scaly, long-acuminate, sparsely pubescent only in upper part outside, reddish and with fine golden, roundish, sessile glands, densely ciliate. Ligulate florets yellow, 1.3–1.6 cm long, one and one-quarter to one and one-half times as long as involucre, with 5 mm long tube, shorter than pappus, ligules linear, 0.8 cm long, 1 mm wide, three-veined, covered with long, scattered, white hairs and fine golden glands on outer side in lower and middle part, three-toothed, teeth glandular; tubular florets 7 mm long, as long as pappus, five-toothed, teeth acute, glandular. Achenes linear-oblong, 3 mm long, 462 0.2 mm wide, longitudinally ribbed, brown, covered with dark brown, short, upward appressed hairs; pappus of numerous bristles, two and one-half times as long as achenes. Flowering VI–VII.

Zone of grass-forb steppe, meadow steppes and among shrubs, in mountains at 1,100–2,600 m; feathergrass, steppe, herbaceous, and dry slopes, sometimes as weed. —*European Part*: Upper Dnieper, Middle Dnieper, Volga-Don, Trans-Volga, Bessarabia, Black Sea Region, Crimea, Lower Don, Lower Volga; *Caucasus*: Ciscaucasia, Dagestan, eastern and southern Transcaucasia, Talysh; *Soviet Central Asia*: mountainous Turkmenia. *General distribution*: Central Europe, Balkans-Asia Minor, Armenia and Kurdistan, Iran. Described from Austria. Type in London.

20. **I. auriculata** Boiss. and Bal. in Boiss. Diagn. ser. II, 3 (1856) 13; Boiss. Fl. Or. III. 192; Grossh. Fl. Kavk. IV, 109.

Perennial. Plant 25–50 cm high, entirely (except inner involucral bracts and florets) lanate-velutinous, densely covered with multicellular, white, more or less appressed, fine hairs. Stem erect, more or less flexuous, striate, sparsely leafy, with short cymose branches in upper part. Basal and lower leaves 15–20 cm long, 3–4 cm wide, broad-lanceolate or oblong-spatulate, on 3.5–7.0 cm long petiole; upper leaves oblong-lanceolate, 6–8 cm long, 1.5–3.0 cm wide, sessile, short-decurrent, amplexicaul, with round and broad auriculate appendages; leaves on peduncles oblong-lanceolate, 2.5–4.0 cm long, 0.5–1.0 cm wide, basally round, sessile, all obtuse, entire or indistinctly toothed. Capitula solitary or 3–7(10), 1.2–2.3 cm wide, on slender, (1)3–7 cm long peduncles, in compact corymbs. Involucre 1.0–1.5 cm wide, three-rowed, imbricate; involucral bracts one-veined, almost equal; outer bracts green, lanceolate, 7 mm long, 1 mm wide, acute, recurved in upper part and densely covered with long white hairs; inner bracts yellowish, narrowly lanceolate, 6–7 mm long, 0.7–1.0 mm wide, mucronate, straight, ciliate. Ligulate florets yellow, 1.0–1.2 cm long, one and one-half to two times as long as involucre, with filiform, 3.0–3.5 mm long tube, two-thirds as long as pappus, ligules linear, 6–8 mm long, 1 mm wide, on outer side usually covered with white hairs and scattered glands at base, three- or four-veined, with three acute teeth; tubular florets yellow, glabrous, 5.0–5.5 mm long, as long as pappus or slightly shorter, five-toothed, teeth equal, glandular outside. Achenes linear-oblong, 1.8 mm long, 0.3–0.4 mm wide, brown, white-hairy; pappus dull-white, two and one-half times or more as long as achenes, of 15 or 16 bristles. Flowering VII–VIII.

Mountains at 1,500–2,000 m, dry and marshy meadows, steppe slopes, forest areas, gorges and ravines.—*Caucasus*: Western and southern Transcaucasia. *General distribution*: Balkans-Asia Minor, Iran. Described from Bozdag. Type in Geneva.

463 *Series* 10. Grombczewskianae Gorschk.—Capitula 1.5–2.5 cm wide; involucre 2 cm wide, outer involucral bracts lanceolate, up to half as long as inner narrow-linear ones.

21. **I. grombczewskii** Winkl. in Tr. Bot. Sada XIV (1895) 149; O. and B. Fedtsch. Perech. Rast. Turk. IV, 173; Fedtsch. Rast. Turk., 734. —*I. thomsonii* Botsch. and Lipsch. in Bot. Zhurn. XLI, 8 (1956) 1168 p. p. non Clarke.

Perennial. Stem cylindrical, reddish, straight or somewhat bent, covered as also leaves, more densely below, with straight, long, white, multicellular hairs on tubercles and with scattered, golden, round, fine, sessile as well as stalked glands. Leaves numerous, ovate-elliptical, 4.5–7.0 cm long, 1.8–3.0 cm wide, short-mucronate, sessile, semiamplexicaul, with small teeth and cilia, with prominent reticulate veins beneath; floral leaves 1.5–4.0 cm long, 0.4–1.5 cm wide. Capitula 2.5 cm wide. Involucre 2 cm wide, many-rowed, imbricate; involucral bracts herbaceous, reddish in upper part, with occasional short and appressed hairs, ciliate; outer bracts oblong-lanceolate, 5 mm long, 1.3–1.6 mm wide, acute; middle bracts linear, 8 mm long, 0.8 mm wide, mucronate; inner bracts narrowly linear, 13 cm long, 0.5–0.8 mm wide, finely long-acuminate, straight, only apex recurved. Ligulate florets usually dark yellow, up to 1.8 cm long, with 5–6 mm long tube, as long as pappus, ligules linear, 1 cm long, 1.6 mm wide, twisted, with three or four reddish veins at throat, covered with short white upward appressed hairs and fine glands, three-toothed; central [disk] florets tubular or obconical, as long as pappus or slightly longer, pale yellow, five-toothed, teeth glandular outside. Achenes terete, 3 mm long, 0.3 mm wide; densely covered with long, white, appressed hairs; pappus setose, two times as long as achenes. Flowering VII.

Mountains. —*Soviet Central Asia*: Pamiro-Alai. Endemic. Described from Sandal Pass. Type in Leningrad.

Note. Collected in 1890 by Grombczewski (upper part of the plant) and named in his honor by Winkler, *I. grombczewskii* has not been found again by anyone in Soviet Central Asia.

It is easily distinguished from *I. thomsonii* Clarke by a reddish stem, covered, as also the leaves (particularly on the lower side), with large golden glands (compared to a green stem covered, like the leaves, with fine, scattered, brown glands), larger capitula, with unequal involucral bracts, in the upper part reddish; by outer bracts that are 5 mm long, middle ones to one-third longer, and inner ones surpassing the middle ones by up to a third (compared to almost the same); by ligulate florets that are dark-yellow, 1.8 cm long (compared to yellow, 1.4 cm long), with the ligules 1 cm long, in the lower part toward tube covered with
464 short, white, straight, upward-appressed hairs and fine glands (compared to 7–8 mm long, glabrous); and by central disk florets that are 1 cm long, with the teeth glandular on the outside (compared to 0.6–0.7 cm long, glabrous).

22. **I. rubtzovii** Gorschk. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVII (1955) 399. —*I. glauca* C. Winkl. var. *badachschanica* Rubtz. in herb. nom. —*I. schischkinii* Gorschk. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, XVII (1955) 400. —*I. schugnanica* Krasch. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR IX, 4–12 (1946) 154 non Winkl. —*I. thomsonii* Botsch. and Lipsch. in Bot. Zhurn. XLI, 8 (1956) 1170 p. p. non Clarke Comp. Ind. (1876) 120.

Perennial. Plant up to 40–50 cm high, green or entirely glaucous, old stems usually condensed, woody, year-old stems flexuous, slender, ribbed, branched from middle or above, as also leaves, covered with long, white, multicellular, divergent hairs on fine tubercles and with numerous golden glands. Leaves oblong or oblong-elliptical, 4–7 cm long, 2–4 cm wide, or ovate or oblong-ovate, up to 3 cm wide, almost coriaceous, semiamplexicaul, sessile, more or less auriculate, usually short-acuminate. Capitula 1.5–2.0(2.5) cm wide, in groups of one to three, terminal on branches, often subtended by two or three short bracts. Involucre 1.0–1.7 cm wide, imbricate, many-rowed; involucral bracts unequal, appressed hairy, particularly middle and inner bracts covered with fine golden glands; outer bracts ovate-lanceolate, lanceolate or oblong, sometimes in upper part green, 3–5 mm long, 1.8–2.0 mm wide, middle bracts usually linear-lanceolate, one-third longer or two times as long as outer; inner bracts narrowly linear, 0.9–1.0 cm long, 1 mm wide, one-third longer than middle bracts or equal, 0.5 mm wide, in upper part reddish-violet like middle bracts, all bracts straight, mucronate, densely ciliate. Ligulate florets yellow or pale yellow, one-third longer than involucre, with tube slightly shorter than pappus, ligules linear, 5–7 mm long, 1 mm wide, three-toothed and three-veined on outer side, particularly in lower part, at throat covered with scattered, fine golden glands; tubular central [disk] florets yellow or pale yellow, 6–7 mm long, as long as pappus, with five sparsely glandular teeth. Achenes brown, 2.0–2.5 mm long, 0.3 mm wide, covered with upward appressed white hairs; pappus one and one-half to two times as long as achenes, white, of numerous short plumose bristles. Flowering VIII.

Mountains, in rock crevices. —*Soviet Central Asia*: Pamiro-Alai (Badakhshan). Endemic. Described from the valley of the Pyandzh River between Nishus and Anderob (Vakhan). Type in Leningrad.

Note. I. Rubtzovii Gorschk. differs from *I. thomsonii* Clarke by oblong, oblong-elliptical, or ovate (but not elliptical) leaves; by smaller 465 capitula, with the involucres 1.0–1.7 cm wide (but not 2.5–5.0 cm wide), and usually one to three at the tips of the branches (but not solitary); by unequal involucral bracts with appressed short hairs, reddish-violet in the upper part with scattered glands (compared to almost equal, green and glabrous bracts); by ligules covered outside in the lower part with scattered, fine glands (not glabrous); and by central [disk] florets with glandular teeth (not glabrous).

Series 11. Britannicae Gorschk. —Capitula (0.8)2.5–4.5(5.0) cm wide; involucres (0.7)1–2(2.2) cm wide, the bracts equal or outer ones lanceolate or linear-lanceolate, to two-thirds as long as inner, linear ones.

23. **I. britannica** L. Sp. pl. (1753) 881; M.B. Fl. taur.-cauc. II, 317 and III, 574; DC. Prodr. V, 467; Ldb. Fl. alt. IV, 94 and Fl. Ross. II, 505; Boiss. Fl. or. III, 193; Beck l. c., 37; Schmalh. Fl. II, 51; O. and B. Fedtsch. Perech. Rast. Turk., IV, 172; Kom. and Alis. Opredel. Rast. Dalnevost. Kr. II, 1024; Grossh. Fl. Kavk. IV, 168; Krylov, Fl. Zap. Sib. XI, 2710; Klokov in Vizn. Rosl. URSR, 528, 529. —*I. dysenterica* Georgi Bemerk. Reise im Rüssisch. Reich. (1775) 230, non L. —*I. comosa* Lam. Fl. franc. II (1778) 147. —*I. serrata* Gilib. Fl. Lithuan. III (1781) 207 and Exerc. Phytol. I (1792) 169. —*I. repanda* Turcz. in Bull. Soc. Nat. Mosc. VII (1837) 154, nom. —*I. tymiensis* Kudo, Contr. Fl. North Sachal. (1923) 58. —*I. britannica* var. *tymiensis* Kudo ibid. 58. —*Aster orientalis* S.G. Gmelin, Reise I (1770) 155, tab. XXXVI. —*Conyza britannica* Moris. ex Rupr. Fl. Ingric. (1860) 569. —**Ic.**: Rchb. Ic. Fl. Germ. XVI, tab. 925, 926; Syreistsch. Ill. Fl. Mosk. Gub. III, 251; Hegi. Ill. Fl. VI, 1, 484, fig. 245, a–f; Majevsk. Fl., Izd. 8, Fig. 212; Sorn. Rast. SSSR, IV, Fig. 456. —**Exs.**: GRF No. 620. —Fl. Gall. et Germ. exs. No. 1229; Fl. Boh. et Mor. exs. No. 392; Fl. Čechosloven. exs. No. 94; Fl. exs. Austro-Hungar. No. 1822; Fl. exs. Reipubl. Bohem. Sloven. Nos. 76, 931, 932.

Perennial. Plant 15–65 cm high, appressed-hairy or lanate, covered with multicellular, long, white, thin hairs, often basally thickened. Rhizome cylindrical, 1–2 mm wide, nodulose, obliquely creeping; stem erect,

longitudinally ribbed, ascending, simple or branched above, sometimes reddish in lower part. Lower leaves elliptical or lanceolate, occasionally ovate, 4–11 cm long, 1.0–2.5 cm wide, on 1–5 cm long petiole; middle and upper leaves oblong-lanceolate or lanceolate, 2.5–9.0 cm long, 0.6–2.2 cm wide, sessile, with cordate amplexicaul base, sometimes auriculate, all leaves acute, entire or with fine occasional teeth and short spinules along margin, glabrous or sparsely hairy above, densely glandular-hairy beneath. Capitula usually less numerous, two to five (very rarely 25), in lax corymbs, sometimes solitary, 3.0–4.5(5) cm wide, with lanceolate acute, 0.7–1.5(2.5) cm long, 1–5 mm wide floral leaves; peduncles slen-
466 der, 1.0–4.5 cm long. Involucre 1.3–2.0(2.2) cm wide, of numerous bracts; involucral bracts equal, acute, recurved; outer bracts linear-lanceolate, 8 mm long, 0.8 mm wide, outwardly green, appressed-hairy; middle bracts, as also outer, 0.6 mm broad, in upper part green, smooth, in lower part pubescent; inner bracts yellowish-white, membranous, linear, 0.4 mm wide, glabrous, with sparse, long cilia, all bracts covered with golden glands; very rarely involucral bracts enlarged, exceeding ligulate florets. Ligulate florets 1.5–1.6 cm long, two times as long as involucral bracts, yellow, with corolla tube as long as or slightly shorter than pappus, ligules linear, 1 cm long, 0.7 mm wide, three-veined and with three deltoid, acute teeth, in upper part sparsely glandular; tubular florets yellow, usually as long as pappus, five-toothed, teeth equal, outwardly covered with golden glands. Achenes linear-oblong, 1 mm long, 0.2 mm wide, brown, basally somewhat, narrowed, longitudinally ribbed, with straight, white, upward-appressed, bicellular hairs, in upper part sometimes with fine glands, pappus dirty white, 4–5 mm long, of 15–16 bristles, basally unevenly short-connate. Flowering VI–IX.

Plants widely distributed in forest-steppe, steppe, and semidesert zones in larch, mixed, and pine forests, in forest glades, cut-over areas, and edges; meadows, banks of rivers, streams, lakes, ponds, estuaries and riverine sands. In the mountains it goes up to the middle zone.

Note. It is a highly polymorphic plant varying in the degree of branching of the stem, shape and size of the leaves, type of pubescence, size and number of the capitula, size and shape of the involucral bracts, degree of pubescence of the achenes, etc. About 15 varieties and forms, for the most part not isolated geographically, have been described. Here we cite only the most characteristic ones:

α. *sublanata* Kom. Fl. Manchzh. III (1907) 626. —Stem, leaves, peduncles, and involucral bracts lanate-velutinous.

γ. *ramosissima* Ldb. Fl. Ross. II (1844–1846) 507. —Stem highly branched, with large number of capitula; outer involucral bracts broadly lanceolate.

δ. *angustifolia* Beck, Inulae Eur. (1881) 38. —Leaves narrowly lanceolate, 3–8 cm long, 0.5–1.0 cm wide.

var. *setosa* H. Krasch. Fl. Yugo-Vost. VI (1936) 326. —Plant villous and with scattered, short, setaceous hairs or tubercles; achenes glabrous or with occasional hairs.

var. *stepposa* Serg. in Krylov. Fl. Zap. Sib. XI (1949) 2710. —Leaves lanceolate or linear-lanceolate, pilose on both sides; capitula few (sometimes solitary), clustered; involucral bracts usually glandular along margin.

467 *European Part*. Karelia-Lapland, Dvina-Pechora, Baltic Region, Ladoga-Ilmen, Upper Volga, Volga-Kama, Upper Dnieper, Middle Dnieper, Volga-Don, Trans-Volga, Upper Dniester, Bessarabia, Black Sea Region, Crimea, Lower Don, Lower Volga; *Caucasus*: Ciscaucasia, Dagestan, western, eastern, and southern Transcaucasia, Talysh; *Western Siberia*: Ob Region, Upper Tobol, Irtysh, Altai; *Eastern Siberia*: Yenisei, Lena-Kolyma, Angara-Sayans, Dauria; *Far East*: Kamchatka, Okhotsk, Zeya-Bureya, Uda River area, Ussuri, Sakhalin; *Soviet Central Asia*: Aralo-Caspian, Balkhash Region, Dzhungaria-Tarbagatai, mountainous Turkmenia, Syr-Darya, Pamiro-Alai, Tien Shan. *General distribution*: Scandinavia (southern Sweden), central Europe, Atlantic Europe (eastern part of France), Mediterranean (western and northern Italy), Balkans-Asia Minor, Armenia and Kurdistan, Iran, Dzhungaria-Kashgaria, Mongolia, Japan, China. Described from western Europe. Type in London.

Economic Importance. The leaves are used in folk medicine to heal wounds (Zemlinskii, *Lekarstv. Rast. SSSR*, Ed. 2, 101). Plant with a more or less garlic odor.

24. **I. macrolepis** Bge. in Mem. Sav. Etr. Petersb. VII (1847) 330; Boiss. Fl. or. III, 194. —*I. britannica* var. *vulgaria* Beck, Inulae Eur. (1881) 38; O. and B. Fedtsch. Perech. Rast. Turk. IV, 172.

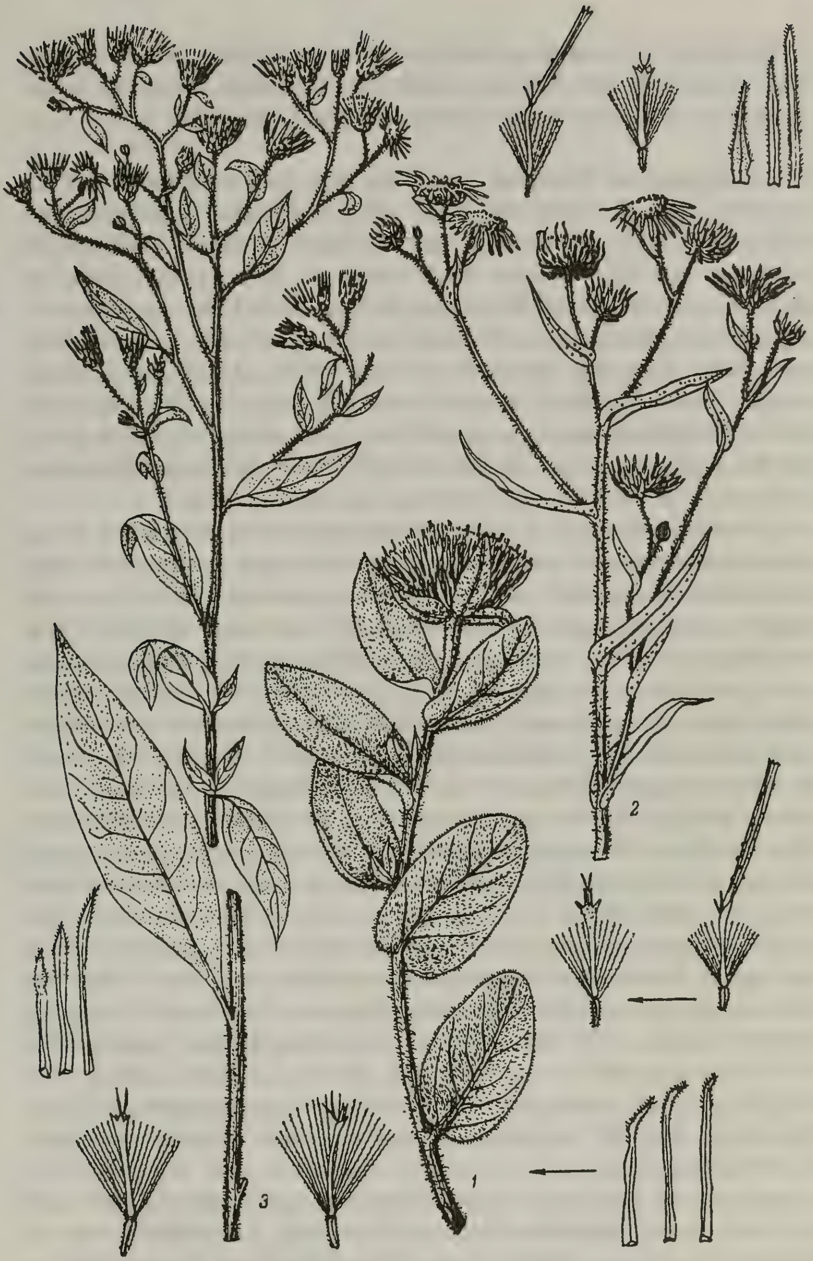
Biennial. Stem 50 cm high, erect, short-pilose at base, scabrous-strigose above, covered with white hairs sessile on tubercles, in upper part branched. Leaves glabrous above, with long appressed hairs beneath; basal leaves oblong-linear, 9 cm long, 1.5 cm wide, sometimes with 2–5 cm long petiole, toothed; cauline leaves lanceolate, 12 cm long, 1.5–2.0 cm wide, acuminate, basally cordate, semiamplexicaul; floral leaves 3–6 cm long, 0.3–0.8 cm wide. Capitula 2.5–3.0 cm wide on densely pubescent 4.5–5.0 cm long peduncles, numerous, often in clusters of two or three in corymbs. Involucre many-rowed, 1.8–2.0 cm wide; outer involucral bracts narrowly linear-lanceolate, 5–7 mm long, 1.2 mm wide, acute, as also the middle bracts, from base white-villous and cililate; middle bracts linear, 9 mm long, 1 mm wide, mucronate; inner bracts narrowly linear, as long as middle ones, 0.3–0.7 mm wide, sometimes almost filiform, finely long-acuminate, in upper part appressed, short-pilose and ciliate. Florets yellow, ligulate, 1 cm long, slightly longer than involucral bracts, with 4 mm long tube, not as long as pappus, ligules linear, 6–7 mm long, 0.7–0.9 mm wide, three- or four-veined, glabrous, three-toothed; tubular florets 5.5 mm long, as long as pappus, five-toothed, teeth outwardly covered with golden glands. Achenes brown, 1 mm long, 0.3 mm wide, covered with short upward-appressed white hairs; pappus of 26 bristles, five times as long as achenes. Flowering VII–IX.

Soviet Central Asia: Pamiro-Alai, ?Syr-Darya. Endemic. Described from the vicinity of Samarkand. Type lost.

Note. First collected by Leman. In 1932, B.A. Fedtschenko found this plant in Tadjikistan on the banks of the Kafirnigan River near Stalinabad.

468 25. **I. lineariifolia** Turcz. in Bull. Soc. Nat. Mosc. VII (1837) 154; Kom. Fl. Manchzh. III (1907) 623; Kom. and Alis. Opredel. Rast. Dalnevost. Kr. II, 1024. —*I. britannica* var. *lineariaefolia* (Turcz.) Rgl. in Mém. Acad. Sc. Pétersb. sér. VII, IV, No. 4 (1861) 85. —*I. britannica* var. *maximowiczii* Rgl. ibid. 85. —*I. britannica* subsp. *linariaefolia* Kitam. in Mém. Coll. Sc. Kyoto Imp. Univ. ser. B, XIII (1937) 265.

Perennial. Plant 50–100 cm high. Stem yellowish-green, sometimes reddish, simple or branched, covered with white, scattered, multicellular, appressed hairs. Leaves linear-lanceolate, acute, entire or with small occasional teeth, glabrous above, sparsely pubescent beneath; lower leaves 10 cm long, 0.9 cm wide, on 3 cm long petiole; upper leaves sessile, 6–10 cm long, 0.5–1.0 cm wide; floral leaves 1–4 cm long, 1.5–4.0 mm wide. Capitula 0.8–2.8 cm wide, on glandular hairy, 0.5–3.0 cm long peduncles, in clusters of 5–25, in corymbs. Involucre 1.0–1.3 cm wide; involucral bracts straight, sometimes outer bracts recurved, acute, with golden, upward-appressed, ellipsoid, sessile or short-stalked glands along margin; outer bracts lanceolate, 3.0–3.5 mm long, 0.8 mm wide, basally coriaceous, in upper part herbaceous, pubescent; middle bracts membranous, 4–5 mm long, 0.6 mm wide, in upper part sometimes reddish; inner bracts linear, membranous, as long as middle ones, 0.3 mm wide, glabrous. Florets yellow, ligulate 0.7–1.2 cm long, 2–3 times as long as involucral bracts, on outer side covered with scattered golden glands, with 2.0–2.5 mm long tube, not as long as pappus, ligules linear, 4.0–7.5 mm long, 0.8 mm wide, three- or four-veined and three-toothed in upper part; tubular florets as long as pappus, yellow, with five acute teeth, glandular along margin. Achenes terete, oblong, finely ribbed, brown, 1.0–1.2 mm long, 0.2–0.4 mm wide, sparsely pubescent with upward appressed hairs; pappus 3 mm long, of 25 bristles. Flowering VII–VIII.



469

Plate XXVIII.

1—*Inula glauca* Winkl., upper part of plant, involucral bracts, ligulate and tubular florets; 2—*I. caspica* Blum., upper part of plant, involucral bracts, ligulate and tubular florets; 3—*I. vulgaris* (Lam.) Trevisan, upper part of plant, part of shoot with leaf; involucral bracts; ligulate and tubular florets.

Banks of rivers, streams, and lakes; flooded meadows and as a weed. —*Far East*: Zeya-Bureya, Ussuri. *General distribution*: Mongolia, Japan, China. Described from North China. Type in Leningrad.

26. **I. japonica** Thunb. in Nova Acta Soc. Sc. Upsal. IV (1784) 35, 39 and Fl. japonica (1784) 318; Kom. and Alis. Opredel. Rast. Dalnevost. Kr. II (1932) 1024.—*I. chinensis* Rupr. in Maxim. Prim. Fl. Amur. (1859) 149; Kom. and Alis. Opredel. Rast. Dalnevost. Kr. II (1932) 1024.—*I.* 471 *britannica* var. *chinensis* Rgl. Tentam. Fl. Ussur. (1861) 84.—*I. britannica* var. *japonica* Miq. ex Kom. Fl. Manchzh. III (1907) 625.—*I. britannica* var. *ramosa* Kom. Fl. Manchzh. III (1907) 626.—*I. britannica* subsp. *japonica* Kitam. in Mem. Coll. Sci. Kyoto Imp. Univ., ser. B, XIII (1937) 263.—*I. britannica* subsp. *japonica* Kitam. var. *ramosa* Kitam. in Mem. Coll. Sci. Kyoto Imp. Univ., ser. B, XIII (1937) 264. —**Ic.**: Somoku Dzusetzu, ed. 2, XVII, tab. 3; Kom. and Alis., op. cit., II, Plate 306, 4.

Perennial. Plant (20)70 cm–1 m high; stem erect, cylindrical, longitudinally finely ribbed, usually reddish, in upper part covered with long, white, multicellular hairs on fine tubercles, branched above. Leaves elliptical or oblong-elliptical; upper leaves 7–11 cm long, 0.8–2.0(3.5) cm wide, lower 10.0–13.5 cm long, 2.6–3.0(4.5) cm wide; all leaves sessile, with fine teeth almost glabrous or with scattered hairs above, densely villous beneath, particularly along veins finely glandular, floral leaves 1.3–4.5 cm long, 0.2–0.5(0.8) cm wide, lanceolate. Capitula 4 cm wide, on slender, densely pubescent, up to 9 cm long peduncles, usually numerous (very rarely solitary), in corymbs, 8–13 cm long, up to 9–10 cm wide. Involucre 1.8 cm wide, three-rowed; outer involucral bracts linear-lanceolate, 6–7(8) mm long, 1 mm wide, acute, peduncles on outer side, divergent, middle bracts linear, usually as long as outer, 0.6 mm wide; inner bracts narrow-linear, 7 mm long, 0.4–0.5 mm wide, glabrous, membranous, all bracts acute. Florets yellow, ligulate 1.1–1.8 cm long, two times as long as involucral bracts, mostly glabrous or sometimes sparsely glandular outside, with tube somewhat shorter than pappus, ligules linear, 0.7–1.5 cm long and 1.0–1.3 mm wide, four-veined, three-toothed; central [disk] florets 4 mm long, five-toothed, as long as pappus. Achenes 1.0–1.5 mm long, 0.2 mm wide, sparsely puberulent; pappus 4 mm long, of 25 bristles. Flowering IX.

Beach grass [*Calamag rostis*], herbaceous, and marshy meadows and thin larch forest, sometimes as weed. *Far East*: Zeya-Bureya, Ussuri. *General distribution*: China, Japan. Described from Japan. Type in Sweden.

Section 3. AEGOPHTHALMUS Schott and Kotschy ex Benth. and Hook f. Gen. II (1873) 330.—Section *Oegophthalmus* Benth. ex C.B. Clarke

Compos. indic. (1876) 117.—Group *Acaules* Boiss. Fl. or. III (1875) 185, 195.—Plants stemless, very rarely with strongly condensed stem; basal leaves numerous, rosulate; capitula solitary or many.

27. **I. acaulis** Schott and Kotschy ex Boiss. Fl. or. III (1875) 195. —*I. acaulis* Schott and Kotschy ex Tchihat. As. Min. Bot. II (1860) 243 nom. nudum; Grossh. Fl. Kavk. IV, 107.—**Ic.**: Gard. Chron. Ser. III, LVI, 246.

472 Perennial. Plant stemless, very rarely with strongly condensed stem, 5–10 cm high. Leaves usually all basal, rosulate, oblong-spatulate or elliptical, 2–6 cm long, 0.6–1.2 cm wide, obtuse, narrowed into 0.5–1.0 cm long petiole; cauline leaves two to four, like basal leaves, all glabrous, with 1.0–1.8 cm long stiff, white, multicellular cilia. Capitula usually solitary (rarely two), 3.5–4.0 cm wide, mostly sessile. Involucre 1.8–2.5 cm wide, many-rowed, imbricate, involucral bracts one-veined, almost equal; outer bracts green, oblong, 0.9–1.0(1.2) cm long, 2.0–3.5 mm wide, obtuse, along margin sometimes reddish, with occasional multicellular cilia sessile on tubercles, recurved; inner bracts membranous, lanceolate or linear-lanceolate, 1 cm long, 1–2 mm wide, mucronate, straight, ciliolate, in upper part usually reddish. Ligulate florets yellow, glabrous, along margin of teeth and vein reddish; 1.8 cm long, almost two times as long as involucral bracts, with filiform, 7 mm long tube shorter than pappus, ligules linear, 1.2 cm long, 2 mm wide, divergent, three- or four-veined and three- or four-toothed; tubular florets filiform, 0.8 cm long, not as long as pappus, yellow, glabrous, with five equal glabrous teeth. Ovary 1.5 mm long, sparsely pubescent with upward-appressed hairs; pappus 0.9–1.0 cm long, of numerous (up to 50) bristles. Achenes not found. Flowering VII–VIII.

Subalpine and alpine zones, meadows. —*Caucasus*: Southern Transcaucasia. *General distribution*: Balkans-Asia Minor, Armenia and Kurdistan. Described from Asia Minor (Cilicia; Kotschy pl. exs. No. 252). Cotype in Leningrad.

28. **I. rhizocephala** Schrenk in Fisch. and Mey. Enum. pl. nov. I (1841) 51; Ldb. Fl. Ross. II, 507; Boiss. Fl. or. III, 196; O. and B. Fedtsch. Perech. Rast. Turk. IV, 173; Krylov, Fl. Zap. Sib. XI, 2712. —*Conyza rhizocephala* Rupr. in Osten-Sacken et Rupr. Sert. tiansch. (1869) 51. —**Exs.**: GRF No. 3259. —**Ic.**: Hook. Ic. Pl. XVIII, tab. 1730.

Perennial or biennial. Plant stemless. Leaves numerous, all basal, rosulate with rosette (5)8–25(35) cm wide, oblong or oblong-ovate, (2.5)4–16 cm long (including petioles), (2)2.5–3.5 cm wide, exceeding inflorescence, obtuse, indistinctly and broadly sinuate-toothed, densely ciliate, with 2.0–3.5 cm long winged petiole, covered on both sides and on

prominent midrib beneath with scattered dense, long, white, multicellular, appressed and scattered, fine, glandular hairs. Capitula 1.5–3.0 cm wide, numerous (8–20), sessile or on densely pubescent 2–3 cm long peduncles, aggregated in compact hemispherical, sessile, almost capitate inflorescence. Involucre 1.2–1.5(2) cm wide, many-rowed; outer bracts lanceolate-linear, 7–9 mm long, 1.0–1.1 mm wide, acute, pubescent, recurved; inner bracts linear or narrowly linear, 1.2 cm long, 0.8–1.0 mm wide, membranous,
473 straight, glandular-hairy, all bracts acute, apically purple and ciliolate. Florets yellow, ligulate 1.5 cm long, slightly longer than involucral bracts, glabrous, with 7 mm long tube, almost half as long as pappus, ligules linear, as long as tube, with three short teeth; tubular florets 9 mm long, slightly shorter than pappus, with five smooth teeth. Achenes terete, 1.5–2.0 mm long, 0.3 mm wide, longitudinally finely ribbed, brown, covered in upper part with appressed, short, dark brown hairs; pappus 6–8 times as long as achenes, of numerous bristles. Flowering VI–VIII.

Mountains, at 1,700–3,500 m, fir and spruce forests, granite, stony, and clayey slopes and high mountain plateaus and passes. —*Soviet Central Asia*: Dzhungaria-Tarbagatai; Pamiro-Alai, Tien Shan, mountainous Turkmenia (Mt. Chapan-Dag). *General distribution*: Iran, Dzhungaria-Kashgaria. Described from Tarbagatai. Type in Leningrad.

Section 4. BREVILIGULATAE (Beck) Gorschk. comb. nov. —Subsection *Breviligulatae* Beck, Inulae Europ. (1881) 11, 49. —Subgenus *Pseudoconyza* Cosson and Germain, Fl. Paris, II (1845) 413 p. p. —Section *Coinyzoides* Kirschleg. Fl. voges. rhen. (1870) 342. —*Cappa* Avetis. in Izv. Akad. Nauk Arm. SSR, VIII, No. 6 (1955) 105, non DC. —Peripheral florets with fine, somewhat concealed, ligules or usually filiform-tubular, without ligules, sometimes with one to four staminodes; anthers appendages usually acute, one-third as long as anthers.

29. **I. vulgaris** (Lam.) Trevisan, Fl. Eugan. (1842) 29; Beck l. c. 49; O. and B. Fedtsch. Perech. Rast. Turk. IV, 172; Grossh. Fl. Kavk. IV, 106. —*Inula conyza* DC. Prodr. V (1836) 464; Ldb. Fl. Ross. II, 501; Boiss. Fl. or. III, 190; Schmalh. Fl. II, 52. —*I. pseudoconyza* Alb. in Bull. Herb. Boiss. II (1894) 453. —*Conyza squarrosa* L., Sp. pl. (1753) 861, non *Inula squarrosa* L.: MB. Fl. taur.-cauc. II, 363; III, 569. —*C. vulgaris* Lam. Fl. Franc. II (1778) 73. —*C. squarrosa* All. Fl. pedem. I (1785) 175. —**Ic.**: Rchb. Ic. Fl. germ. XVI, tab. 923; Jav. and Casp. Fl. Hung. 514; Hegi, Ill. Fl. VI, 1, tab. 262. —**Exs.**: Pl. Abchas. exs. No. 479; Fl. Gall et Germ. No. 2090; Fl. Siles, exs. No. 614; Fl. Boh. et Morav. exs. No. 495.

Biennial. Plant 40–120 cm high, throughout finely flocculose-tomentose, covered with long, white, slender, multicellular hairs. Rhizome woody, cylindrical, nodulose; stem finely ribbed, green, often at base or throughout reddish, erect, branched above. Leaves elliptical, oblong-elliptical, or lanceolate; lower leaves 10–13 cm long, 3–4 cm wide, decurrent, narrowed into 3–8 cm long petiole; upper leaves 6–11 cm long, 2.0–4.5 cm wide, basally slightly tapering, almost sessile; leaves on peduncles lanceolate, 2–4 cm long, 0.8–1.0 cm wide, all acute, broadly sinuate or sparsely small-toothed, sparsely above densely lanate-tomentose beneath. 474 Capitula 0.5–1.2 cm wide, numerous, on 0.3–0.8 cm long peduncles, in 10 cm long, 12 cm wide, compact, corymbose panicle. Involucre 0.5–0.8 cm wide, three-rowed; involucral bracts acute, on outer side covered with scattered, short, white, appressed hairs, ciliate, in upper part reddish, with green midrib; outer bracts lanceolate, 4–6 mm long, 1 mm wide, basally membranous, yellowish, with herbaceous, recurved, glandular-hairy apex; middle bracts linear, 1 cm long, 0.8 mm wide, as also inner bracts, straight; inner bracts narrowly linear, 1.1 cm long, 0.4–0.5 mm wide. Peripheral florets many-whorled, (7)8.0–8.5 mm long, somewhat shorter than involucral bracts (middle and inner bracts), reddish, ligulate, not many, shorter than pappus, with 5 mm long tube and small, 1 mm long, 0.2 mm broad ligule with (two to five) usually three sparsely hairy teeth; filiform-tubular peripheral florets numerous, four- or five-toothed; central [disk] florets tubular, brownish, as long as peripheral florets, tube somewhat shorter than pappus, short five-toothed, teeth on outer side sparsely glandular. Achenes terete, longitudinally finely ribbed, brown, 2.0–2.5 mm long, 0.2–0.3 mm wide, in upper part covered with short, dark brown, upward-appressed hairs; pappus three times as long as achenes, of 30 bristles. Flowering VI–VII. (Plate XXVIII, Fig. 2).

Glades in larch forests; calcareous and stony slopes and riverbanks and valleys. —*European Part*: Middle Dnieper, Bessarabia, Crimea; *Caucasus*: Ciscaucasia, Dagestan, western and eastern Transcaucasia, Talysh. *General distribution*: Central Europe, Atlantic Europe, Balkans-Asia Minor (Turkey). Described from France. Type in Geneva.

Note. The report by O. and B. Fedtschenko (*Perech. Rast. Turk.*, IV, 172) about the occurrence of this species in northern Turkmenia (Karelin) is not confirmed.

30. **I. thapsoides** (Willd.) DC. Prodr. V (1836) 464; Ldb. Fl. Ross. II, 502; Boiss. Fl. or. III, 190; Schmalh. Fl. II, 52; Grossh. Fl. Kavk. IV, 106. —*Conyza thapsoides* Willd. Sp. pl. III, 3 (1800) 1949; M.B. Fl. taur.-cauc. II, 304 and III, 569. —**Ic.**: Rchb. Pl. Crit. IV, tab. 347.

Perennial. Plant 30–85 cm high, grayish, densely tomentose-sericeous; root thick, woody with strong fragrance. Stem erect, longitudi-

nally sulcate, simple or sometimes branched above, basally almost woody, internodes broad-winged due to decurrent leaves. Lower leaves oblong-lanceolate or oblong, 18–22 cm long, 5.5–8.0 cm wide, narrowed into 6 cm long petiole; upper leaves ovate or elliptical, (8)10–20 cm long, (3)4.5–7.0 cm wide, sessile, decurrent; all leaves shortly and obtusely acuminate, finely sinuate-toothed, sometimes entire. Capitula 0.8–1.5 cm wide, sessile or on short peduncles, surrounded by 1.2–1.5 cm long, 0.3–
475 0.4 cm wide, oblong, floral leaves, as long as or longer than capitula; capitula numerous (up to 30), in groups of 5–15 in compact corymbs (clusters). Involucre 0.7–1.2 cm wide, many-rowed, appressed, imbricate; outer bracts herbaceous, linear-lanceolate, 7 mm long, 1.5 mm wide, acute, straight, densely pubescent-tomentose; inner bracts linear, sometimes almost filiform, 0.8–1.0 cm long, 0.5–0.7 mm wide, mucronate, in lower part glabrous, above or only in upper part densely pubescent; all bracts ciliate. Florets yellow, peripheral florets covered outside with long scattered hairs, as long as inner involucral bracts, straight, mostly filiform-tubular, as long as less numerous ligulate florets; ligulate florets 0.7–0.9 cm long, with 0.6 cm long tube, as long as pappus, ligules 0.3 cm long, 0.5 mm wide, narrowly linear, two- to five-toothed; tubular [disk] florets as long as peripheral florets or somewhat shorter, glabrous, five-toothed; teeth of all florets sparsely glandular and ciliate. Achenes linear-oblong, 2.0–2.5 mm long, 0.3 mm wide, longitudinally finely sulcate, brown, in upper part pubescent; pappus 6–7 mm long, of numerous (up to 30) dark brown bristles. Flowering VI–VII.

Mountains, to 1000 m. —*European Part*: Crimea; *Caucasus*: Ciscaucasia, western Transcaucasia. *General distribution*: Balkans-Asia Minor (northwestern part of Asia Minor), Armenia and Kurdistan, Iran (northern). Described from the Caucasus. Type in Berlin.

31. **I. decurrens** M. Pop. in Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR, VIII, No. 5 (1940) 76.

Perennial. Stem angular, simple, up to 50 cm high, with short branches, covered as also leaves (sparsely above, densely beneath) with numerous, long, white hairs thickened at base; internodes broad-winged due to decurrent leaves. Leaves oblong or oblong-lanceolate, acute; middle leaves 7 cm long, 2.2 cm wide, lower up to 9.5 cm long, 3.6 cm wide; all leaves tapering toward base, upper leaves coarsely and lower finely toothed. Capitula obconical, 1 cm wide, in groups of 5–10 in compact corymbose-capitate inflorescence, surrounded by lanceolate, 1.0–1.5 cm long and 0.3–0.6 cm wide floral leaves. Involucre 5–6 mm wide, many-rowed, imbricate; outer bracts lanceolate, 4.0–4.5 mm long, 0.7–1.0 mm wide, densely pubescent; middle bracts linear, 7 mm long, 0.5 mm wide; inner bracts narrowly linear, 7 mm long, 0.3 mm wide, as also middle, membranous and pubescent only in upper part; all bracts acute. Florets yellow, ligulate florets filiform, 2.7–3.0 mm long, half to two-thirds as long as pappus and inner and middle involucral bracts, with 2 mm long tube, ligules truncate, (0.7)1.0 mm long; tubular [disk] florets 4.0–4.5 mm long, somewhat shorter than pappus, five-toothed, teeth 1 mm long. Ovary oblong 0.6 mm long, 0.2 mm wide, glabrous; pappus 5 mm long, of 12 white barbed bristles. Flowering VIII.

Mountains, in ravines. —*Soviet Central Asia:* mountainous Turkmenia. Endemic. Described from western part of Kopetdag, Gyuen Ravine. Type in Leningrad.

32. **I. multicaulis** Fisch. and Mey. Ind. Sem. Hort. Petrop. I (1835) 30; Ldb. Fl. Ross. II, 508; Boiss. Fl. or. III, 191; O. and B. Fedtsch.
476 Perech. Rast. Turk., IV, 173. —*I. crithmoides* Spreng. Syst. III (1826) 520, non L.

Perennial. Plant 12–35 cm high, basally woody; root vertical, woody. Stems numerous (13–20), slender, erect or somewhat bent, longitudinally weakly ribbed, with few branches, greenish, covered, as also leaves, with fine, multicellular, long, curly hairs and scattered golden glands. Leaves oblong, linear-spatulate, or linear, 2.5–3.0 cm long, 2.5–5.0 mm wide, broad-spatulate or oblong-elliptical, 4.5 cm long, 8 mm wide (var. *latifolia* Gorschk.); upper leaves linear, 0.6–1.5 cm long, 0.6–1.0(2.5) mm wide, or oblong, 2.5 cm long, 4 mm wide (var. *latifolia* Gorschk); all leaves sessile, involute. Capitula 1.7–2.0 cm wide, solitary, terminal on stems. Involucre 1.4 cm wide; outer involucral bracts lanceolate, 4 mm long, 1.2 mm wide, acute, short-recurved, as also middle, finely puberulent in upper part, reddish along margin; middle bracts linear, 7 mm long, 1 mm wide, acute; inner bracts narrow-linear, 8 mm long, 0.6 mm wide, yellowish, straight, membranous, acute, glabrous; all bracts ciliate. Ligulate florets yellow, 8.5 mm long, slightly longer than involucre, with 3.5 mm long tube, shorter than pappus, ligules linear, 5 mm long, 0.7 mm wide, three-veined and with three short teeth; tubular florets yellow, 4 mm long, as long as pappus, five-toothed, teeth glandular. Achenes terete, 3 mm long, 0.4 mm wide, brown, longitudinally ribbed, smooth, in upper part pubescent with upward-appressed white hairs; pappus of 20 bristles, 4.0–4.5 mm long. Flowering VI.

Chalky slopes, white marly talus and limestone mountains. —*Soviet Central Asia:* Aralo-Caspian, Kara-Kum (Sary-baba). Endemic. Described from the east coast of the Caspian Sea. Type in Leningrad.

Section 5. LIMBARDA (Adans.) DC. Prodr. V (1836) 470; Beck, l. c. 9. —*Limbardia* Adans. Fam. II (1763) pro gen.—Receptacle glabrous, ovary and achenes indistinctly ribbed, pubescent. Involucral bracts few-rowed, appressed, outer ones all without appendages, inner bracts small, subulate; peduncles thick; leaves succulent.

33. **I. salsoloides** (Turcz.) Ostenf. in Sven Hedin Southern Tibet, VI, III (1922) 39. —*I. ammophila* Bge. ex DC. Prodr. V (1836) 47 and β. *salsoloides,* ibid.; Fedtsch. Rast. Turk. 734. —*I. schugnanica* Winkl. in Tr. Bot. Sada, XI (1890) 276. —*Conyza salsoloides* Turcz. in Bull. Soc. Nat. Mosc. V (1832) 197. —*Iphiona radiata* Benth. in Henders. and Hume, Lahore (1872) 323.

Perennial. Stem up to 35 cm high, white-pubescent below, almost glabrous above, with numerous long, slender spreading, finely ribbed, densely leafy branches. Leaves lanceolate or linear-lanceolate; lower leaves 477 5–9 mm long, 5–6 mm wide, upper 3–5 mm long, 1.8–3.0 mm wide; all leaves sessile, basally almost cordate, thick, mucronate, recurved, villous beneath and with scattered, sessile golden glands, entire, involute. Capitula 1.5 cm wide, numerous, solitary terminal; involucre 0.8 cm wide, many-branched, many-rowed. Involucral bracts appressed; outer bracts oblong-lanceolate or lanceolate, 3 mm long, 1.2 mm wide, middle ones linear, two times as long, 0.4 mm wide; inner bracts narrowly linear, 7–9 mm long, 0.3 mm wide; all bracts acute, in upper part pubescent, on outer side sparsely covered with golden glands, ciliate. Florets yellow, ligulate florets 1.1–1.3 cm long, almost one-third longer than involucral bracts, with 5 mm long tube, shorter than pappus, ligules narrowly linear, 6–8 mm long, 1.0–1.2 mm wide, three- or four-veined and three-toothed; teeth 0.8 mm long; tubular florets as long as pappus or slightly longer, five-toothed, with smooth teeth. Achenes cylindrical, 1.2–2.0 mm long, 0.2 mm wide, brown, longitudinally finely ribbed, covered with scattered, golden, roundish, sessile glands; pappus 6–8 mm long, of numerous bristles. Flowering VI–VIII. (Plate XXIX, Fig. 1).

Mountains at 2,200–2,740 m; gravel riverbeds and sandy riverbanks. —*Soviet Central Asia*: Pamiro-Alai. *General distribution*: Dzhungaria-Kashgaria, Mongolia, China. Described from Mongolia, Khadatu. Type in Leningrad.

GENUS 1497. **Pentanema** Cass.[1, 2]

Cass. in Bull. Soc. Philom. (1818) 74 and Dict. Sc. Nat., 38 (1825) 373; DC. Prodr. V, 474. —Sect. IV *Pentanema* Boiss. Fl. or. III (1875) 199. —

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[1] Treatment by S.G. Gorschkova.

[2] From the Greek words *penta*—five, and *nema*—thread, filament (owing to the shape of the pappus, consisting of five filiform bristles in some species).

Vicoa Cass. in Ann. Sc. Nat. Ser. 1, XVII (1829) 418. —Sect. *Vicoa* O. Hoffm. in Pflanzenfam. IV, 5 (1890) 203

Capitula hemispherical or hemispherical-campanulate, solitary or many, terminal. Involucre consisting of numerous imbricate bracts, usually unequal, mucronate or subobtuse; outer involucral bracts herbaceous, lanceolate, lanceolate-linear, ovate, elliptical-obovate, sometimes with apical appendages or short-mucronate; middle bracts like outer or linear, oblong-lanceolate, subulately acuminate; inner bracts linear-lanceolate, linear, membranous, all bracts glabrous or pubescent with basally thickened white hairs and golden glands or only simple glandular. Receptacle flat, alveolate, glabrous; disk florets tubular, obconical, bisexual, yellow, as long as ligulate florets or 2–31/2 times as long, very rarely shorter; ray florets pistillate, ligulate, yellow, one-whorled, usually few, with narrow, 478 almost filiform corolla and small (0.1–0.3 mm long) ligules (usually purple in *albertoregelia* Winkl.); anthers basally sagittate, with two barbate of ciliate, filiform, short appendages; stigma lobes usually enlarged at tips, sparsely lanate. All achenes similar, oblong or oblong-linear, four-angled, indistinctly ribbed, sparsely pubescent with appressed white hairs; pappus one-rowed (in achenes of ligulate florets sometimes not developed); pappus bristles 8–20, rarely 4–5, in upper part finely short-plumose, sometimes barbed or more or less entire. Dwarf semishrubs with repeatedly branched caudex and lignified, mostly reddish brown stems and sessile or short-petiolate, small leaves (lamina 0.8–2.5, rarely up to 4 cm long); very rarely (*Pentanema divaricatum* Cass.) annual, but then dichotomously branched from base, with slender divaricate, redddish-violet, virgate branches.

The genus consists of about 14 species distributed in southwestern and southern Asia and in Africa (2 species).

Isolated from the general area of distribution, one species is found on the Island of Java.

1. Peripheral florets in capitulum ligulate, central [disk] florets tubular..2

+ All florets in capitulum tubular, with corolla glandular on outer side; achenes with pappus of 18–20 bristles; outer involucral bracts ovate or ovate-lanceolate, attenuated into triangular, green, glandular-pubescent appendages; leaves ovate, sessile...6. **P. glanduligerum** (Krasch.) Gorschk.

2. Plant covered with numerous golden, roundish glands (except corolla of ligulate florets, ovary and achene); leaves oblong-ovate or oblong; achenes with pappus of four to five bristles...3. **P. rupicola** (Krasch.) Groschk.

+ Plant (except corolla of ligulate and tubular florets) covered with multicellular, long, white hairs and roundish, golden glands; leaves broadly ovate, ovate-lanceolate, obovate, or oblong-spatulate; achenes with pappus of 8–15, rarely 5, bristles..............................3

3. Capitula 0.4–0.7 cm wide; outer involucral bracts ovate; ligulate florets with 1.5–2.8 mm long corolla, one-third to half as long as pappus and with 0.3–0.5 mm long, obtuse ligules; tubular florets with corolla 2–3 times as long as corolla of ligulate florets 4

+ Capitula 0.7–1.0 cm wide; outer involucral bracts lanceolate or spatulate-filiform; ligulate florets 5–6 mm long, with corolla somewhat longer than pappus and three-toothed, 1.5–2.0 mm long ligules; tubular florets with corolla as long as or shorter the corolla of ligulate florets...5

4. Stem sparsely pubescent; leaves indistinctly coarse-toothed or entire, with sparse or occasional hairs on both sides; involucral 479 bracts greenish, outer ovate, apiculate; pappus with smooth or short-plumose bristles...........4. **P. parietarioides** (Nevski) Gorschk.

+ Stem densely pubescent; leaves entire, densely pubescent on both sides; involucral bracts violet, outer elliptical-obovate, obtuse; pappus with short-plumose bristles...5. **P. propinquum** (Nevski) Gorschk.

5. Capitula 1 cm wide; outer involucral bracts lanceolate, mucronate; corolla of ligulate florets yellow with usually purple ligules, 1.5 mm long, 0.5–0.8 mm wide; corolla or tubular florets as long as in ligulate florets; achenes with pappus of 8–10 bristles. Semishrubs..........................1. **P. albertoregelia** (Winkl.) Gorschk.

+ Capitula 0.7 cm wide; outer involucral bracts spatulate-filiform, obtuse; corolla of ligulate florets yellow, with ligules 2 mm long, 1.0–1.5 mm wide; corolla of tubular florets two-thirds as long as in ligulate florets; achenes with pappus of five bristles. Annuals. ....2. **P. divaricatum** Cass.

Series 1. Albertoregelia Gorschk. Peripheral florets in capitulum ligulate; central [disk] florets tubular.

1. **P. albertoregelia** (Winkl.) Gorschk. comb. nov. —*Vicoa albertoregelia* Winkl. in Tr. Bot. Sada, XI (1890) 277; O. and B. Fedtsch. Perech. Rast. Turk. IV, 174; Popov in Tr. Uzbeksk. Gos. Univ., Ser. Biolog. No. 27, Vol. 14, 65. —*Inula albertoregelia* (Winkl.) B. Fedtsch. Rast. Turk. (1915) 734. —*I. flexuosa* auct. Fl. As. Med. non Boiss. and Hausskn.

Perennial. Plant 10–17 cm high. Rhizome woody; stems numerous; slender, flexuous, simple or branched above, reddish-brown, soft-villous, densely covered with long, multicellular, slender, white hairs, enlarged at base, leafy up to tip. Leaves broadly ovate-lanceolate, 1.3–2.0 cm long, 0.7–1.0 cm wide; upper floral leaves lanceolate, 0.7 cm long, 0.2 cm wide, all entire mucronate, sessile, with prominent reticulate veins beneath, on both sides densely villous, thickened at base, entire, ciliate. Capitula solitary or two or three (rarely four to six), hemispherical, 1 cm wide. Involucre many-rowed, imbricate, 8 mm wide; outer bracts green, lanceolate, 2–4 mm long, 0.5 mm wide; middle bracts like outer, 5 mm long, 0.8 mm wide and inner ones linear-lanceolate, almost linear, as long as middle ones, mucronate, pubescent, particularly in upper part, long-ciliate. Peripheral florets ligulate, almost as long as involucral bracts, with 4 mm long corolla, pale yellow, tube shorter than pappus, ligules usually purple, 1.5 mm long, 0.5–0.8 mm wide, four- or five-veined, 480 three-toothed, teeth 0.5 mm long, acute, glandular outside with golden glands; central [disk] florets tubular, 5.2–5.5 mm long, with yellow, 4.0–4.5 mm long, five-toothed corolla, slightly longer pappus and as long as corolla of ligulate florets, teeth acute, 0.8 mm long, glandular outside. Achenes oblong-linear, 1 mm long, 0.2 mm wide, covered with appressed brown, scattered hairs; pappus 3.5–4.0 mm long, of 8–10, one-rowed, short-plumose bristles, 3–4 times as long as achenes. Flowering VI–VII. (Plate XXIX, Fig. 3).

Mountains, up to 1,600–2,600 m; belt of arborescent junipers and broad-leaved forests, crevices of rocks, stony slopes and talus, outcrops of conglomerates and granites. —*Soviet Central Asia:* Tien Shan, Pamiro-Alai. Described from Kshtut. Type in Leningrad.

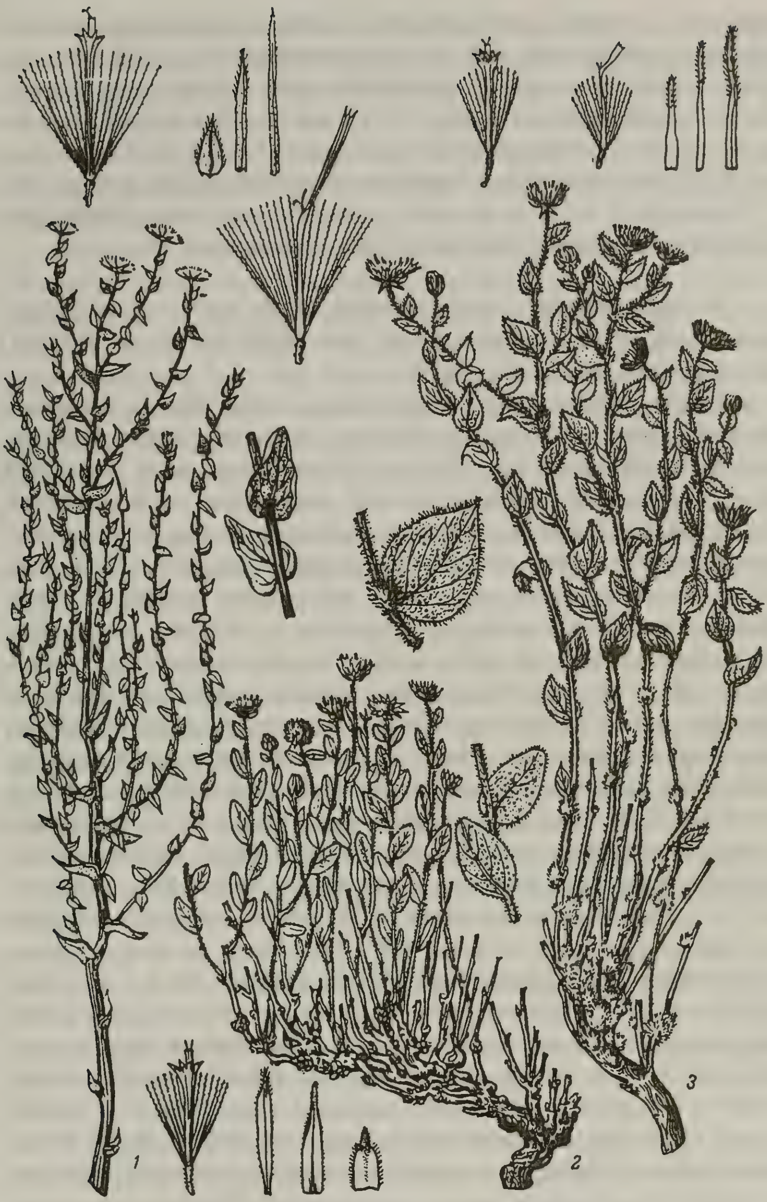
2. **P. divaricatum** Cass. in Bull. Soc. Philom. (1818) 75 and Dict. Sc. Nat. 38, 374; DC. Prodr. V, 475; Nevski in Tr. Bot. Inst. Akad. Nauk SSSR, I, 4, 272; Popov in Tr. Uzbeksk. Gos. Univ., Nov. Ser., Biolog., No. 27, Vol. 14, 65. —*Vicoa divaricata* (Cass.) Benth. and Hook. f. Gen. pl. II (1873–1876) 335; O. and B. Fedtsch. Perech. Rast. Turk. IV, 174. —*V. pentanema* Aitch. and Hemsl. in Trans. Linn. Soc. Ser. 2, III (1886) 75. —*Inula divaricata* (Cass.) Boiss. Fl. or. III (1875) 200 non Nutt.; B. Fedtsch. Rast. Turk. 734. —**Ic.**: Jaub. and Sp. Ill. Fl. or. IV, tab. 350.

Annual. Plant 6–22 cm high, densely covered (except corolla of tubular florets) with 2–3 mm long, fine, white multicellular hairs and occasional fine short-stalked glands; root slender, filiform. Stem slender, brownish or violet, branched, branches filiform, usually divaricate. Leaves distant, thin, bluish-green, sessile; basal leaves obovate or oblong spatulate, 1.5–2.5 cm long, 0.8 cm wide, obtuse, usually rosulate; middle leaves oblong or obovate-oblong, 2–4 cm long, 0.7–1.5 cm wide, at base usually tapering; upper leaves ovate or oblong, 1 cm long, 0.5 cm wide, in lower part slightly narrowed, cordately auriculate, round, almost amplexicaul; floral leaves small, linear or oblong, 0.5 cm long, 0.2 cm wide. Capitula numerous, on long, filiform peduncles, many-flowered, 0.7 cm wide. Involucre 0.6 cm wide, many-rowed, imbricate; involucral bracts one-veined, outer ones spatulate-filiform, 3 mm long, 0.3 mm wide, obtuse, densely glandular-hairy, revolute, middle bracts linear, 4.5–5.0 mm long, 0.3 mm wide, erect, subulate, sparsely glandular-hairy, in 483 upper part, as also outer ones, pilose and ciliate; inner bracts linear, 4 mm long, 0.2 mm wide, erect, almost smooth. Ligulate florets 6 mm long, with yellow, 5 mm long corolla, tube filiform, blue, 3 mm long, as long as pappus and linear, almost recurved, 2 mm long, 1.0–1.5 mm wide ligules, three- or four-veined, with sparse, long, three-toothed hairs outside, teeth glandular-hairy; tubular florets 4 mm long, with yellow obconical filiform, 3 mm long corolla, as long as or somewhat shorter than pappus and two-thirds as long as corolla of ligulate florets; teeth pubescent outside. Achenes 1 mm long, oblong, appressed hairy; pappus of five bristles, three times as long as achenes. Flowering V–VII.

Mountains at 1,000–1,300 m on stony slopes and as weed near reservoirs and settlements. —*Soviet Central Asia:* Kara-Kum (Basin of Amu-Darya, Shurcha-Kuduk), Pamiro-Alai (Kugitang). *General distribution:* Eastern Mediterranean, Iran, Indo-Himalayas (northern India), Africa (tropical). Described from Middle East between Baghdad and Haleb [Aleppo]. Type in Paris.

3. **P. rupicola** (H. Krasch.) Gorschk. comb. nov. —*Vicoa rupicola* Krasch. in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, No. 3 (1936) 344.

Perennial. Plant 7–14 cm high, densely covered with golden, roundish, stalked glands, except ligulate florets and achenes. Rhizome woody, many-stemmed; stems slender, flexuous, crimson, more or less terete, divaricately branched above, branches filiform. Leaves green, thick, coriaceous, oblong-ovate or oblong, 1.0–1.5(2) cm long, 0.5–0.8 cm wide, basally somewhat narrowed or on 3–4 mm long, petiole; floral leaves lanceolate or lanceolate-linear, 8 mm long, 1.5 mm wide, all leaves abruptly acuminate, entire or with small teeth, with veins compressed above, protruding beneath. Capitula one or two, terminal on shoots. Involucre imbricate, many-rowed, 5–7 mm wide, densely glandular; outer bracts lanceolate-linear, (2)3–4 mm long, 0.3–0.5 mm wide; middle bracts similar, 5 mm long, 0.7 mm wide, thick, in upper part with short, white callous, inner bracts oblanceolate-linear, 5–6 mm long, 0.3–0.5 mm wide, mucronate, dorsally almost carinate, densely ciliolate. Peripheral florets ligulate, 2.8–3.0 mm long, filiform, with yellow 2 mm long corolla, two-thirds as long as pappus, tubes 1.8 mm long, ligules obtuse, scarcely



481 Plate XXIX.

1—*Inula salsoloides* (Turcz.) Ostenf., part of plant, part of shoot with leaves, involucral bracts, ligulate and tubular florets; 2—*Pentanema glanduligerum* (Krasch.) Gorschk. Habit of plant, part of shoot with leaf, involucral bracts, floret; 3—*P. albertoregelia* (Winkl.) Gorschk. Habit of plant, part of shoot with leaf, involucral bracts, ligulate and tubular florets.

visible, 0.2 mm long; central [disk] florets tubular, 4.5 mm long, one-third longer than ligulate florets, with corolla obconical yellow, 3.5–4.0 mm long, slightly longer than pappus, five-toothed, teeth 0.2 mm long, densely glandular outside. Achenes oblong, 1.0–1.2 mm long, 0.4 mm wide, usually angular, brown, sparsely appressed-hairy; pappus 3.0–3.5 mm long, of four or five bristles, one-rowed, in upper part short-plumose. Flowering VIII.

Mountains at 1,200 m on rocks. —*Soviet Central Asia*: Pamiro-Alai (Baisun Region, Derbent). Endemic. Type in Leningrad.

484 4. **P. parietarioides** (Nevski) Gorschk. comb. nov. —*Vicoa parietarioides* Nevski in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, No. 4 (1937) 279. —**Ic.**: Nevski, op. cit., Fig. 6.

Perennial. Plant 14–25 cm high, fragrant. Stem thick in lower part with dark brown bark, strongly branched, branches woody, shortened, one-year-old, 12–30 cm long, slender, 0.5 mm thick, weak, purple-dark brown, divaricate, covered with scattered, multicellular, white squarrose, 0.4 mm long hairs, and short-stalked, minute glands. Leaves green, thin, broadly ovate or ovate, sometimes lanceolate-ovate, 0.8–2.0 cm long, 0.5–1.4 cm wide, obtuse, indistinctly and sparsely toothed or entire, sparsely pubescent and usually glandular, on 2.5–3.0 mm long petiole. Capitula solitary terminal, 4–5 mm wide. Involucre many-rowed, imbricate, 5–7 mm wide, outer bracts ovate, 1–3 mm long, 0.7–1.0 mm wide, mucronate, with 0.5 mm long mucro, in lower part green, indistinctly carinate, sparsely pubescent, ciliate; middle bracts lanceolate, 4 mm long, 1 mm wide; inner bracts linear or lanceolate-linear, 4.5–6.0 mm long, 0.5–0.8 mm wide, subacute, like middle ones, yellowish, densely ciliate. Florets yellow; peripheral florets more or less ligulate, filiform, 2.2–2.8 mm long, corolla 1.2–1.8 mm long, one-third to half as long as pappus, tube 1.0–1.6 mm long with scarcely visible, obtuse, straight, 0.1–0.3 mm long ligules, styles long, exserted, 3.5–4.0 mm long, as long as pappus or somewhat longer; central [disk] florets tubular, 5.0–5.5 mm long, corolla three to three and one-half times as long as that of ligulate florets, obconical, as long as pappus, with five lanceolate, 0.5 mm long, straight, acute teeth. Achenes oblong, about 1 mm long, 0.2–0.3 mm wide, brown, covered with scattered, white, short-appressed hairs; pappus of ligulate florets 3.5 mm long, of tubular ones 4–5 mm long, bristles 10–14, almost unequal, white, glabrous or in upper part somewhat plumose. Flowering VI.

Mountain slopes and ravines. —*Soviet Central Asia*: Pamiro-Alai (northwestern slope of the Kugitang Range). Endemic. Described from the place indicated. Type in Leningrad.

Note. In the work of S.A. Nevski (op. cit. p. 281, Fig. 5) the ligulate floret is incorrectly drawn, showing the corolla one-third to half as long as the pappus (not longer) and the style two and one-half times as long as corolla (not equal to it).

5. **P. propinquum** Nevski in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, No. 4 (1937) 280.

Perennial. Plant 4–15 cm high. Stems numerous, slender, flexuous, brown or reddish-brown, with short branches in upper part, densely covered as also leaves, with long, white, multicellular hairs and numerous glands. Leaves 0.8–1.5 cm long, 0.5 mm wide, subobtuse, on both sides 485 densely covered with long hairs and frequent glands, entire, on short 2 mm long petioles; floral leaves 4–5 mm long, 3 mm wide, on 1 mm long petioles. Capitula 5–7 mm wide, one or two at tips of branches. Involucre imbricate, many-rowed; involucral bracts purple, outer obovate, 1.8–2.0 mm long, 1 mm wide; middle bracts oblong-lanceolate, two times as long as outer, 1 mm wide; inner bracts narrowly linear, 5 mm long, 0.6 mm wide, all bracts obtuse, densely ciliate. Florets yellow; peripheral ligulate florets not many, with 1.5–2.0 mm long corolla, ligules obtuse, 0.5 mm long, styles exserted, 3.5 mm long; tubular florets 4–5 mm long, 0.3 mm wide, two to two and one-half times as long as corolla of ligulate florets and as long as pappus or slightly short, obconical, five-toothed, glabrous, teeth 0.3 mm long, acute, covered with scattered five glands. Achenes linear-oblong, 1 mm long, 0.2 mm wide, covered with white, short, upward-appressed hairs; pappus of 15 bristles, unequal, short-plumose, four times as long as achenes. Flowering VII.

Mountains, up to 2,100 m. —*Soviet Central Asia*: Pamiro-Alai (Kugitang). Endemic. Described from the northwestern slope of Kugitang, opposite the village of Kugitang. Type in Leningrad.

Series 2. Glanduligera Gorschk. All florets in capitulum tubular.

6. **P. glanduligerum** (Krasch.) Gorschk. comb. nov. —*Vicoa glanduligera* Krasch. in Tr. Bot. Inst. Akad. Nauk SSSR, Ser. 1, No. 1 (1933) 177.

Perennial. Plant 8–10 cm high. Rhizome woody; stems numerous, simple, terete, slender, brown or sometimes reddish, as also both sides of leaves, covered with numerous long, white, multicellular, basally thickened hairs and round, sessile glands, up to tip densely leafy. Leaves ovate or ovate-lanceolate, 1.0–1.2 cm long, 0.5–0.7 cm wide, acuminate, entire, basally round, sessile; floral leaves ovate or elliptical, 3–5 mm long, 1–2 mm wide, acute, sessile. Capitula solitary, 0.6–1.0(1.6) cm wide. Involucre many-rowed, imbricate, 0.5–1.2 cm wide, with appressed, glandular-hairy bracts, densely ciliate; outer bracts ovate or ovate lanceolate, carinate, yellowish, 2–3 mm long, 1.0–1.2 mm wide, attenuate above into triangular, densely glandular, green tip; middle bracts lanceolate, 5 mm long, 0.6–0.8 mm wide, acute; inner bracts linear or narrowly linear, 5–6 mm long, 0.4 mm wide, acute. Florets yellowish, tubular, as long as inner involucral bracts, with yellow, 4.5–5.0 mm long corolla, as long as pappus, glandular outside, five-toothed, teeth 0.5 mm long, acute, revolute. Achenes 1.0–1.5 mm long, 0.2 mm wide, four-angled, brown, covered with appressed 486 white hairs; pappus, three to four times as long as achenes, of 18–20, short-plumose bristles. Flowering VII. (Plate XXIX, Fig. 2).

Mountains, up to 3,000 m above sea level. —*Soviet Central Asia*: Pamiro-Alai (Vakhan, in the valley of the Pamir River, near Lyangargich fort). *General distribution*: Afghanistan. Described from the place indicated. Type in Leningrad.

GENUS 1498. **Varthemia** DC. [1, 2]

486 DC. Prodr. V (1836) 473. —*Iphiona* Cass. in Bull. Soc. Philom (1817) 153, p. p.; and in Dict. Cc. Nat. XXIII (1822) 609, p. p.; Benth. and Hook., Gen. pl. II, 333, p. p

Capitula small and few-flowered (15–35 florets), obconical or hemispherical, terminal, in racemose; involucre consisting of few, imbricate, usually lax, involucral bracts, quite unequal, outer relatively short and inner relatively long; receptacle glabrous, alveolate, flat or rarely convex; all florets in capitulum bisexual, tubular, with five-toothed corolla; anther lobes with long caudate, usually lacerate, basal appendages; style branches slightly flattened, obtuse, round; achenes slightly compressed or almost terete, covered with short-appressed hairs and sometimes also, glandular. Pappus one-rowed, of numerous, barbed bristles.

Highly branched semishrubs with small, alternate, entire or rarely slightly toothed leaves.

The genus includes four species, three of which are found in the mountains of Asia Minor and Soviet Central Asia, one in Egypt.

1. **V. persica** DC. Prodr. V (1836) 473; Boiss. Fl. or. III, 211. —*Iphiona persica* (DC.) Benth. and Hook. Gen. pl. II, 333.

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[1] Treatment by V.F. Golubkova.

[2] Named in honor of the traveler Lud. de Varthemo, who traveled through the Near East at the beginning of the 16th century.

Perennial. Thickly branched, sturdy plant with stout light gray, nodose root and numerous erect, glaucous, virgate, 20–50 cm high stems, thickly branched a little above base; branchlets short, 2–6 cm long; stems and branches not densely leafy, covered with sessile short-stalked glands, much denser in upper part. Leaves 0.4–3.0 cm long and 0.1–0.5 cm wide, oblong-linear or linear, entire, subacute, some leaves slightly grooved, rarely slightly folded lengthwise, on both sides with sessile and short-stalked glands; floral leaves on peduncle 1–4 mm long, about 1 mm wide, linear, on both sides glandular. Capitula obconical, 3–7 mm wide (in broader upper part). Involucre 3–5 mm wide in upper part; involucral 487 bracts scaly, lax, five- or six-rowed, light colored, with greenish or brownish stripe in middle; outermost bracts very short, 1–2 mm long, broadly lanceolate, obtuse, glandular outside, sessile inner longer and narrower and innermost bracts 8–9 mm long, linear-lanceolate, acute, often recurved, on both sides glabrous or with occasional sessile glands outside; all bracts asperate along margin. Corolla about 5 mm long, as long as pappus, glabrous; style branches quite long, included or slightly exserted from corolla. Achenes 2.0–2.5 mm long, indistinctly ribbed longitudinally, with dense, short-appressed bristles; pappus two times as long as achenes, about 5 mm long. Flowering VII–IX.

Stony mountain slopes, rocks. —*Soviet Central Asia*: mountainous Turkmenia. *General distribution*: Iran. Described from the Teheran Region. Type in Paris.

GENUS 1499. **Pulicaria** Gaertn.[1,2]

Gaertn. De. fr. et. sem. II (1791) 461; DC. Prodr. V, 477; Benth. and Hook. II, 355. —*Francoeuria* Cass. in Dict. Sc. Nat. XXXVIII (1825) 374.—*Platychaeta* Boiss. Diagn. Ser. 1, XI (1849) 5. —*Pterochaeta* Boiss. op. cit. VI (1845) 76. —*Strabonia* DC. Prodr. V (1836) 481

Capitula small, medium, or sometimes large, usually numerous, many-flowered, solitary terminal in corymbose or racemose inflorescences. Involucre almost equaling florets or shorter, hemispherical, many-rowed, imbricate, bracts more or less unequal; outer bracts herbaceous, inner ones entirely or only along margin membranous, yellowish, usually shorter than outer, sometimes as long as or even somewhat longer. Receptacle glabrous, flat or slightly convex, more or less distinctly punctate-alveolate. Florets all yellow, fertile; peripheral florets pistillate, ligulate, one-whorled, with narrow, sometimes filiform, three-toothed ligules; central

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[1] Treatment by V.F. Golubkova.

[2] From the Latin word *pulex*—flea (from the use of dried plants against fleas).

[disk] florets bisexual, tubular, with five-toothed corolla, punctate-glandular outside; anther lobes with long, filiform, basal appendages; style branches on inner side finely nodulose (visible only under high magnification). Achenes homogenous, usually flat or terete, slightly ribbed and short, rough-pilose; pappus two-rowed, outer row of short, setaceous, pellucid scales basally connate in unequally toothed corona, inner row of much longer toothed-scabrous or plumose-toothed (but in some, not our, species short-scaly) hairs exceeding achene or not, sometimes even slightly 488 shorter. Herbaceous annual or perennial, villous, lanate-tomentose or tomentose, rarely subglabrous; stem leafy, usually branched; leaves alternate, not incised, entire or slightly dentate.

The genus encompasses about 50 species distributed mostly in the Mediterranean Region and also in Europe, Africa, and Asia.

Note. Hoffman (in *Pflanzenfam.* IV, 5 (1890) 205) established four sections in this genus. The species of *Pulicaria* growing in the USSR belong to only one section, *Eupulicaria* Hoffm. l. c.

1. Involucral bracts multiseriate, appressed, five- or six-rowed........2
+ Involucral bracts two-rowed, lax, sometimes three-rowed in some 4
2. Annual plant; ligulate peripheral florets usually not longer or slightly longer than involucre and with erect ligules; leaves basally round, lower leaves short-petiolate; stem usually branched from base...1. **P. prostrata** (Gilib.) Aschers.
+ Perennials; ligulate peripheral florets 1.5–2.0 times as long as involucre and with recurved ligules; leaves stipulate with deeply cordate base, all sessile, slightly amplexicaul; stem branched only in upper part or from middle..3
3. Capitula quite large, involucre 1.1–1.5 cm wide, not many, 3–15(20) on each plant; ligulate peripheral florets with 9–11 mm long corolla, two times as long as involucre.......................... ....2. **P. dysenterica** (L.) Gaertn.
+ Capitula smaller, involucre 0.7–1.0 cm wide, numerous, 15–70 on each plant; ligulate peripheral florets with 6.5–8.0 mm long corolla, usually one and one-half times as long as involucre. Plant more densely branched..................................3. **P. uliginosa** Stev.
4. Capitula quite large, involucre 9–15 mm wide, few, 10–40 on each plant; leaves obovate-spatulate, gradually narrowed into petiole, slightly wavy.......................................4. **P. salviifolia** Bge.
+ Capitula smaller, involucre 5–8(10) mm wide, more numerous, 20–300 on each plant; leaves oblong (except lowermost oblong-spatulate), sessile, round or weakly cordate at base, semiamplexicaul, strongly curly-wavy......5. **P. gnaphalodes** (Vent.) Boiss.

Section 1. EUPULICARIA Hoffm. in Pflanzenfam. IV, 5 (1890) 205. — Inner row of pappus consisting of toothed-scabrous or plumose-toothed bristles, and outer row looking like toothed corona but not connate.

489 1. **P. prostrata** (Gilib.) Aschers. Fl. Brand. 1 (1864) 304; Grossh. Fl. Kavk., IV, 109; Opredel. Rast. Kavk. 448; Krylov, Fl. Zap. Sib. XI, 2713. —*P. vulgaris* Gaertn. De. fruct. et sem. II (1791) 461; DC. Prodr. V, 478; Ldb. Fl. Ross. II, 2, 509; Boiss. Fl. or. III, 204; Schmalh. Fl. II, 52; Krylov. Fl. Alt. 3, 607. —*P. undulata* Meyer, Verz. Pfl. Cauc. (1831) 79. —*Inula pulicaria* L. Sp. pl. (1753) 882; Ldb. Fl. alt. IV (1833) 93. —*P. prostrata* Gilib. Fl. Lithuan. III (1787) 205. —*Aster pulicarius* Scop. Fl. carn. II (1772) 172. —*Diplopappus pulicarius* Bluff. and Fingerh. Fl. Germ. II (1825) 369. —**Exs.**: GRF No. 177; Fl. **Exs.**: Austro-Hung. No. 3799; Fl. Silesica exs. No. 1307. —**Ic.**: Fl. Yugo-Vost. VI, Fig. 675; Gaertn. op. cit. tab. 173, fig. 7; Hegi, Ill. Fl. VI, 1, fig. 246.

Annual. Entire plant tomentose-pilose or lanate-villous (var. *villosa* Hohenack., *Enum. Talysch.*, 1837, 58). Stem erect or ascending, usually branched from base, sometimes from middle, tomentose above and with scattered, fine, yellowish, pellucid, sessile or very short-stalked glands, less densely pubescent below. Leaves (0.7)1–3(4) cm long, 0.2–0.8(1.0) cm wide; lower leaves oblong, short-petiolate; other leaves sessile, oblong-lanceolate with truncate round base, somewhat sinuate, entire or finely but sparsely toothed, subacute or obtuse, tomentose or almost lanate on both sides, more densely beneath and usually densely covered with sessile or subsessile, pellucid, golden-yellow glands. Capitula hemispherical, numerous, (10)20–80(100) on each plant, in clusters of few or solitary terminal in dense irregular panicles. Involucre 5–8(10) mm wide, hemispherical; involucral bracts numerous, five- or six-rowed, inner ones longer, all appressed, linear or narrowly oblanceolate-linear, acute and sometimes recurved, outwardly lanate and finely punctate with sessile glands. Ligulate peripheral florets small, not exceeding involucre or scarcely as long as involucre, almost as long as tubular disk florets or slightly longer; corolla of ligulate florets 2.5–3.5 mm long, almost as long as style, slightly longer than inner row of pappus, outwardly covered with scattered, pellucid, golden-yellow glands and occasional simple hairs, mainly in upper part, ligules erect, almost oval, about 1 mm wide; corolla of tubular central [disk] florets about 2 mm long, slightly longer than inner row of pappus, outwardly covered with glands and simple hairs, as also ligulate florets. Achenes 1.5–1.8 mm long, about 0.5 mm wide, as long as inner row of pappus bristles or even slightly longer, oblong, somewhat appressed and longitudinally ribbed, entirely covered with occasional, short, appressed, hairs; inner row of pappus more or less 1.5 mm long, of 6–12, somewhat unequally dentate-scabrous hairs, outer

490 whorl of pappus short, about 0.3 mm long. Plant with an unpleasant odor. Flowering VI–IX. (Plate XXX, Fig. 4).

Moist places, wet meadows, ditches and roadsides, banks of rivers and lakes, rarely in alkaline meadows. —*European Part*: Baltic, Volga-Kama, Upper Dnieper, Middle Dnieper, Volga-Don, Trans-Volga, Black Sea Region, Crimea, Lower Don, Lower Volga, Bessarabia; *Caucasus*: Ciscaucasia, Dagestan, eastern and southern Transcaucasia, Talysh; *Western Siberia*: Upper Tobol, Irtysh, Altai; *Far East*: Ussuri; *Soviet Central Asia*: Aralo-Caspian, Balkhash Region, Dzhungaria-Tarbagatai, mountainous Turkmenia, Syr-Darya, Tien Shan? *General distribution*: Scandinavia, Central Europe, Mediterranean, Balkans-Asia Minor, Armenia and Kurdistan, Iran, Dzhungaria-Kashgaria, Mongolia. Described from western Europe. Type in London.

Economic Importance. Used in folk medicine, for example, *P. dysenterica* (L.) Gaertn., as a remedy for dysentery.

Note. B.A. Fedtschenko (*Rast. Turk.*, 1915, 35) cites *P. gracilis* Heimerl., with reference to Androsov's collections from Farab. The plants preserved in the herbarium of the Botanical Institute of the Academy of Sciences of the USSR that were collected by Androsov on 7.IX.1913 from the vicinity of Ashkhabad (at Ak-tepe) and identified by B.A. Fedtschenko as *P. gracilis* Heimerl. belong to *P. prostrata* (Gilib.) Aschers.

2. **P. dysenterica** (L.) Gaertn. De fr. et sem. II (1791) 462; DC. Prodr. V, 479; Ldb. Fl. Ross. II, 2, 510; Boiss. Fl. or. III, 201. p. p.; Schmalh. Fl. II, 53 p. p.; Katina in Vizn. Rosl. URSR, 530. —*Inula dysenterica* L. Sp. pl. (1753) 882; M.B. Fl. taur.-cauc. III, 574. —*Aster dysentericus* Scop. Fl. carn. II (1772) 172. —*Diplopappus dysentericus* Bluff. and Fingerh. Fl. Germ. II (1825) 369. —**Exs.**: Fl. It. exs. No. 380; Fl. Bohem. et Sloven. No. 1180; Fl. Austro-Hung. No. 3798. —**Ic.**: Hegi, Ill. Fl. VI, 1, tab. 262, fig. 4, 4a, 4b, 4c.

Perennial. Rhizome rather thick, creeping, producing short branches; stem 20–60 cm high, erect, paniculately branched, but not densely, only above or from middle, lanate-tomentose (as also branches) and sparsely covered with fine sessile glands, less densely hairy in lower part. Leaves soft, 1.7–5.5(6.0) cm long, 0.7–2.0(2.3) cm wide; upper leaves smaller, lowermost oblong or oblanceolate on condensed stock, other cauline leaves lanceolate, sessile with auriculate, deeply cordate and slightly amplexicaul base, subacute or obtuse, besides apiculate, more or less distinctly finely and remotely sinuate-toothed or usually upper leaves almost entire, somewhat sinuate, green and asperate above due to short hairs on very minute tubercles, sometimes almost glabrous, finely grayish tomentose or almost lanate beneath. Capitula 3–15(20) on each plant, in lax corymbs or racemes on long lanate-tomentose 2–6 cm long pe-

491 duncles. Involucre hemispherical, 1.1–1.5 cm wide; involucral bracts numerous, five- or six-rowed, linear, long-attenuate-acuminate, almost filiform, sometimes in mostly outer bracts, uncinate, outwardly lanate-tomentose-pilose and sparsely glandular with punctate granulose glands, on inner side sparsely hairy or almost glabrous. Ligulate peripheral florets two times as long as involucre and almost three times as long as tubular disk florets, with (8)9–11 mm long corolla, more than two times as long as style and inner row of pappus, on outer side sparsely glandular mainly in upper part, ligules recurved, 1.0–1.3 mm wide, four-veined; central [disk] florets tubular with 3.5–4.5 mm long corolla, slightly longer than inner row of pappus, style branches and anthers slightly exserted, usually sparsely glandular in upper part. Achenes 1.25–1.5 mm long, 0.3–0.4 mm wide, one-third to half as long as inner bristles of pappus, oblong, slightly compressed, longitudinally ribbed, in upper half along ribs covered with occasional short setaceous hairs; inner row of pappus consisting of 15–22 toothed-scabrous hairs, 3.0–4.3 mm long, outer about 0.25 mm long. Plant with an unpleasant odor. Flowering VI–IX. (Plate XXX, Fig. 3).

Ditches and roadsides, in wet meadows and scrubs, edges of marshes, streambanks and also saline soils. —*European Part*: ?Upper Dniester, Upper Dnieper, Middle Dnieper, ?Black Sea Region (western part), ?Bessarabia. *General distribution*: ?Scandinavia, central Europe, Atlantic Europe, Mediterranean, Balkans-Asia Minor. Described from Europe. Type in London.

Note. This plant is distributed mainly in western Europe. It has been reported by several authors (Ledebour, Boissier, B.A. Fedtschenko, and others) from a number of regions of the central and southern belts of European Russia, including the Crimea and the Caucasus, and by N.V. Pavlov from the mountains of southern Kazakhstan and Turkestan. Of late, it is being reported from the steppe region of Ukraine. In the herbarium of the Botanical Institute there is no material of this species from the USSR. It is possible that this plant occurs in some of the southwestern regions of the European Part of the USSR. In southern Ukraine (Kherson Region), the Crimea, the Caucasus and in Soviet Central Asia, *Pulicaria dysenterica* (L.) Gaertn. is replaced by the extremely closely related species *P. uliginosa* Stev.

Economic Importance. In folk medicine it is used as a cure for dysentery.

3. **P. uliginosa** Stev. in DC. Prodr. V (1836) 478; Ldb. Fl. Ross. II, 2, 510; Grossh. Fl. Kavk. IV, 109; Opredel. Rast. Kavk. (1949) 449; Katina in Vizn. Rosl. URSR (1950) 531. —*P. dysenterica* (L.) Gaertn. var. *uliginosa* Hohenack. Enum. Talüsh. (1837) 58. —*P. dysenterica* (L.)

Gaertn. β. *uliginosa* Schmalh. Fl. II (1897) 53. —*P. elata* Boiss. Diagn. Pl. or. I, No. 11 (1849) 6. —*P. dysenterica* (L.) Gaertn. β. *microcephala* Boiss. Fl. or. III (1875) 202. —*P. dysenterica* (L.) Gaertn. γ. *stenophylla* Boiss. l. c.—?*Inula dentata* Sibth. and Sm. Prodr. Fl. Graec. II (1813)
492 181, No. 2078. —*I. dysenterica* (L.) Gaertn. var. *taurica* M.B. Fl. taur.-cauc. III (1819) 575 (in nota). —**Exs.**: GRF No. 1777, a, b; Fl. It. Exs. No. 38 (sub. nom. *P. dysenterica* (L.) Gaertn. β. *microcephala* Boiss.).

Perennial. Stem erect, 30–70 cm high, usually from middle or only above, rather strongly paniculately branched, short-tomentose or tomentose-pilose, more densely above. Leaves lanceolate or (mostly upper leaves) oblong-lanceolate, 6.0–1.5 cm long, 0.4–0.2 cm wide, acute or (var. *stenophylla* (Boiss.) Golubk.) oblong-linear, 3–8 mm wide, and obtuse, basally cordately auriculate, semiamplexicaul, more or less unequally and distantly serrulate-denticulate or almost entire, finely tuberculate-pilose or finely, tuberculately, almost tomentose pilose above. Capitula (15)20–70 on each plant; involucre 7–10 mm wide. Peripheral florets ligulate, one and one-half times or more as long as involucre, with 6.5–8.0 mm long corolla, ligules recurved, about 1 mm wide, corolla of tubular central [disk] florets about 3 mm long. Achenes about 1 mm long and 0.3 mm wide. In other respects plant resembling *P. dysenterica* (L.) Gaertn. Flowering VII–IX. (Plate XXX, Fig. 1, 2).

Moist places, wet meadows, edges of ditches and roads, marshy lands, along banks of rivers, streams, and lakes, near springs. —*European Part*: Black Sea Region (Khersonsk Province), Crimea; *Caucasus*: All regions; *Soviet Central Asia*: mountainous Turkmenia, Syr-Darya, Pamiro-Alai, Tien Shan. *General distribution*: Mediterranean, Balkans-Asia Minor, Armenia and Kurdistan, Iran. Described from southern Crimea. Type in Helsinki.

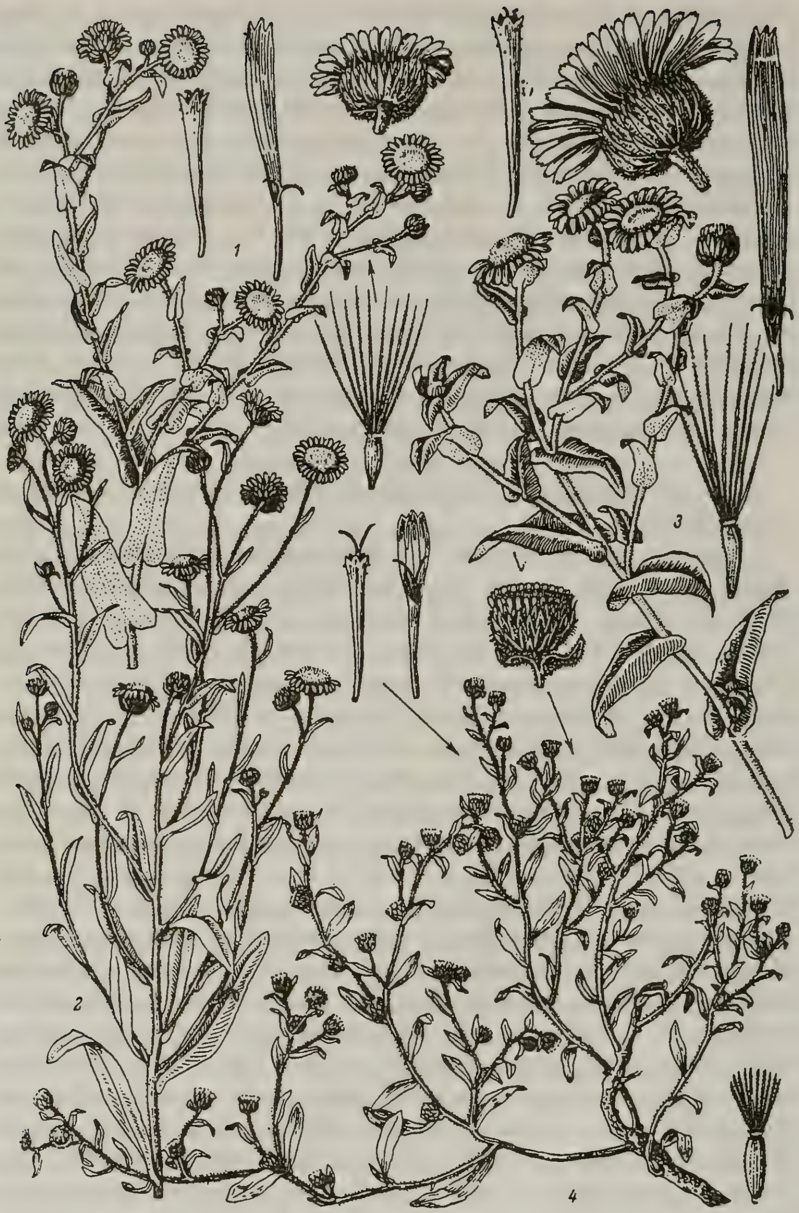
Note. The species is very close to *P. dysenterica* (L.) Gaertn. but adequately distinguished from it, mainly by smaller and more numerous capitula and, correspondingly, by smaller involucres and florets, of which the ligulate florets usually are one and a half (and not two) times as long as the involucre; besides, by a more thickly branched stem as well as by somewhat narrower (in the typical form) and more acute leaves.

P. uliginosa Stev. var. *stenophylla* (Boiss.) Golubk., initially described by Boissier as the species *P. elatior*, but later treated by him as variety γ. *stenophylla* Boiss. of *P. dysenterica* (L.) Gaertn., differs from the typical form by leaves that are more narrow, linear-lanceolate or (usually upper ones) linear-oblong, less acute and often even obtuse, less deeply cordate or (upper ones) even round-cordate at the base, and, finally, not so dense; and by pubescence that is more dense, and somewhat more bluish-green over the whole plant. This variety is mostly found
495 among Central Asian and Iranian specimens and to us appears similar if

not identical to *P. gracilis* Heimerl. The latter is represented in the herbarium of the Botanical Institute of the Academy of Sciences of the USSR by only the type specimen, collected in 1882 in Iran by I.E. Polak and T. Pichler. A comparison of the description of *P. gracilis* Heimerl. and its above-indicated type with the available type and other material of *P. uliginosa* var. *stenophylla* (Boiss.) Golubk. showed that one of the characteristic features of *P. gracilis* Heimerl is, in contrast with the above-mentioned variety, the little-branched stem with few (three to seven) and, moreover, short branchlets at the tip, which might be explained by the habitat conditions and incomplete development of the plant. In the other characters (shape and position of leaves, pubescence), *P. gracilis* Heimerl resembles *P. uliginosa* var. *stenophylla* (Boiss.) Golubk. I refrain from making a final judgment about the separateness of *P. gracilis* Heimerl in view of the inadequacy of the available material.

4. **P. salviifolia** Bge. in Mém. Sav. Etr. Pétersb. VII (1854) 331; Boiss. Fl. or. III, 203.

Perennial. Root 0.5–1.5 cm, light fuscous at root collar, longitudinally rugose, often with cracked bark; entire plant grayish-tomentose (var. *canescens* Winkl. ex. O. and B. Fedtsch. in *Perech. Rast. Turk.* No. 2168), densely white tomentose (var. *lachnophylla* Winkl. ex O. and B. Fedtsch. l. c.), or sometimes with sparsely tomentose leaves and glabrescent stem (var. *glabrescens* Winkl. ex. O. and B. Fedtsch. l. c.), besides short-stalked glands, glands concealed by tomentum in densely tomentose plants. Stem solitary or few, strongly branched from base or slightly above, branches straight. Leaves 0.8–4.5 cm long, 0.4–1.5 cm wide; lower leaves much larger, obovate-spatulate, gradually tapering toward base in petiole, petiole as long as lamina in lower leaves, one-third to half in middle and upper leaves, slightly sinuate, apically round, with indistinct veins on both sides but in densely tomentose plants veins completely concealed by tomentum. Capitula numerous, medium, in quite lax racemes terminating somewhat thick and usually slightly arcuate shoots. Involucre 9–15 mm wide; involucral bracts not numerous, lax in two (rarely three) rows, almost all equal, 4–7 mm long, 0.5–1.2 mm wide, lanceolate, acute, along margin membranous; inner bracts somewhat less densely tomentose and much narrower, sharply acute with much broader membranous margin, scarcely visible, irregularly lacerate-serrate. Ray florets not more than one and one-half times as long as involucre and almost as long as disk florets, with 7–8 mm long corolla, one and one-
496 half times as long as style and inner row of pappus, outwardly with occasional glands, ligule oblique, 1.5–2.0 mm wide, obovate, apically tepering; corolla of central [disk] florets tubular, narrow, 5–8 mm long, with exserted style branches and anthers apices, scarcely longer or equal



493 Plate XXX.

Habit of plant, capitulum; corolla of peripheral ligulate floret, corolla of tubular central [disk] floret, achene. 1—*Pulicaria uliginosa* Stev.; 2—*P. uliginosa* var. *stenophylla* (Boiss.) Golubk., only habit of plant; 3—*P. dysenterica* (L.) Gaertn.; 4—*P. prostrata* (Gilib.) Aschers.

to inner bristles of pappus, sparsely glandular outside. Achenes 2.0–2.75 mm long, about 0.5 mm wide, slightly compressed, one-third to half as long as inner row of pappus, along entire length sparsely covered with appressed or remote short hairs and in upper part, besides them, with sessile or short-stalked glands; inner row of pappus of numerous, 5–7(8) mm long plumose-barbed whitish hairs; outer corona of pappus about 0.5 mm long. Flowering VII–X. (Plate XXXI, Figs. 2, 3, 4).

Pebbly and stony slopes of mountains, stony and stony-sandy banks and gravel beds of rivers. —*Soviet Central Asia*: Dzhungaria-Tarbagatai, Syr-Darya, Pamiro-Alai, Tien Shan. Described from Upper Zeravshan. Type in Leningrad.

Note. Winkler's (l. c.) var. *canescens* agrees with the type.

5. **P. gnaphalodes** (Vent.) Boiss. in Walp. Rep. VI (1846–1847) 144; Diagn. pl. I, fasc. 6 (1845) 76; Fl. or. III, 203. —*Inula gnaphalodes* Vent. Descr. pl. jard. Cels. (1800) 75. —*Strabonia gnaphalodes* DC. Prodr. V (1836) 481. —**Ic.**: Vent. ibid. tab. 75.

Perennial. Root thick, vertical, brownish, longitudinally rugose. Stems many, arising from root collar, strongly branched throughout; branches straight, slender, virgate, upright-spreading, entirely, particularly at base, white lanate-tomentose, toward apex less dense and long, and with sessile or subsessile yellow glands, usually concealed by tomentum, sometimes at apex only glandular and then greenish; all stems and branches densely leafy. Leaves 0.5–3.0(4.0) cm long, 0.1–1.0 cm wide, oblong, basally round or weakly cordate, semiamplexicaul, sessile; lowermost leaves oblong-spatulate, short-petiolate, subobtuse or obtuse, along margin strongly curly-sinuate, with prominent midrib and indistinct lateral veins beneath, on both sides tomentose like stem, but somewhat less densely. Capitula small, more numerous than *P. salviifolia* Bge., terminal on slightly thickened stem and in forks of branches. Involucre 0.5–0.8(1.0) cm wide; involucral bracts not numerous, lax, two(three)-rowed, 2–4 mm long, 0.5–0.7 mm wide; outer bracts slightly shorter and broader than inner, oblong-lanceolate, acute bracts; all bracts more or less densely tomentose outside and covered with sessile glands; inner bracts less densely pubescent, along margin somewhat membranous and somewhat toothed-fimbriate. Ray florets not many, small, slightly long as than involucre, with 4–5 mm long corolla, two times as long as style or
497 less, as long as inner row of pappus or slightly longer or shorter, sparsely glandular outside, ligules about 1 mm wide, almost oval; corolla of tubular central [disk] florets 3.0–4.5 mm long, anther tips exserted, often enclosing stigma branches, as long as inner row of pappus, shorter or longer, sparsely glandular outside. Achenes 2.0–2.5 mm long, about 0.5 mm wide, two times or more as long as inner row of pappus, slightly

compressed, densely sericeous or not and glandular usually only in upper part below corona; inner row of pappus hairs plumose-barbed, 4–5 mm long, 15–25, outer corona of pappus about 0.5 mm long. Flowering V–IX. (Plate XXXI, Fig. 1).

Rocks, stony places and along dry riverbeds. —*Soviet Central Asia*: Kyzyl-Kum, mountainous Turkmenia. *General distribution*: Iran. Described from the Elburz [mountain] (Iran). Type in Paris.

GENUS 1500. **Amblyocarpum** Fisch. and Mey.[1,2]

Fisch. and Mey. in Ind. sem. hort. Petrop. III (1837) 30; DC. Prodr. VII (1838) 286; Benth. and Hook. Gen. pl. II, 336

Capitula quite small, many-flowered, in ones or twos, terminal. Involucral bracts unequal, imbricate, two- or three-rowed; outer bracts herbaceous, slightly longer than inner membranous bracts. Receptacle hemispherical, base finely punctate-alveolate; all florets in capitulum fertile, yellow; ray florets pistillate, one-whorled, slightly longer than central [disk] florets, very short-ligulate, ligules linear, three-toothed; central [disk] florets bisexual, in many whorls, tubular, five-toothed; anthers with short basal appendages; style branches linear-spatulate. Achenes small, more or less fusiform, ribbed, in upper part swollen and truncate, glandular; pappus absent. Annual or biennial herbs with entire leaves.

Monotypic Iranian-Caucasian genus.

1. **A. inuloides** Fisch. and Mey., Ind. sem. hort. Petrop. III (1837) 30; DC. Prodr. VII, 286; Ldb. Fl. Ross. II, 619; Boiss. Fl. or. III, 214; Grossh. Fl. Kavk. IV (1934) 110; Opredel. Rast. Kavk. (1949) 449. — **Exs.:** Pl. or. exs. No. 398. —**Ic.**: Pflanzenfam. IV, 5 (1890) 206 (Fl.).

Annual or biennial. Stems 20–60 cm high, solitary, branched, branches short, divergent, as also stem, somewhat puberulent. Leaves oblong-lanceolate, 1.5–8.0 cm long, 0.4–2.0 cm wide; lower leaves short-
498 petiolate, the rest sessile, at base cuneately tapered, remotely sinuate-toothed, acute, sparsely appressed-pilose above or almost glabrous, sparsely appressed-pilose beneath and finely punctate-glandular. Capitula 6–8 mm wide, hemispherical, surrounded by few bracteal leaves and involucral bracts longer than capitula; outer involucral bracts slightly longer than capitulum, 4–5 mm long, lanceolate, greenish, usually recurved, out-

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[1] Treatment by V.F. Golubkova.

[2] From the Greek words *amblys*—obtuse, and *karpos*—fruit (named for the obtuse apex of the achenes).

wardly with occasional soft hairs and sessile glands, inside glabrous; inner bracts oblong, 3–4 mm long, almost as long as capitulum, membranous, light colored, greenish in middle, along margin sometimes short plumose, and toothed-scabrous, with occasional sessile glands outside. Corolla of ray florets about 2 mm long, of central florets 1.0–1.5 mm long, all with occasional sessile minute glands. Achenes 1.0–1.5 mm long, slightly compressed, with 4–5 prominent ribs. Flowering VIII–IX.

Forested mountain slopes, edges, groves, forest glades. —*Caucasus*: Eastern Transcaucasia, Talysh. *General distribution*: Iran. Described from Lenkoran area. Type in Leningrad.

GENUS 1501. **Carpesium** L.[1,2]

L. Sp. pl. (1753) 859

Capitula many-flowered, small or rather large, discoid or ovate-oblong, drooping, solitary terminal or axillary on short peduncles. Involucre hemispherical, sometimes slightly appressed, many-rowed, consisting of imbricate, erect or recurved bracts; outer involucral bracts not many, foliaceous, middle, coriaceous-membranous with foliaceous apex, inner ones coriaceous-membranous. Receptacle flat, glabrous; all florets in capitulum fertile, tubular, annularly thickened at base, yellow; peripheral florets pistillate, many-whorled, short-tubular, three- to five-toothed at apex; central [disk] florets bisexual, usually wider, with five-toothed limb; anthers with caudate basal appendages; style branches linear-spatulate, rounded; achenes elongated, more or less fusiform, longitudinally sulcate, at base sometimes with few glands, above narrowed to glutinous, 501 mostly tuberculate-glandular beak, terminating in small scutellate or shallowly infundibular areola, with cartilaginous and somewhat thickened border, considered by many authors as "annular disk" or "annular pappus." Perennial herbs with erect, branched, pubescent or subglabrous stem and alternate, entire or sometimes toothed, ovate or oblong leaves.

The genus consisting of nine species, most of them found in Japan, while some species grow in Europe and temperate Asia.

1. Petioles slender, not winged (or very narrowly winged in lowermost leaves), base of leaves cuneate..2
+ Petioles very broadly winged, cuneate below, base of leaves round 3

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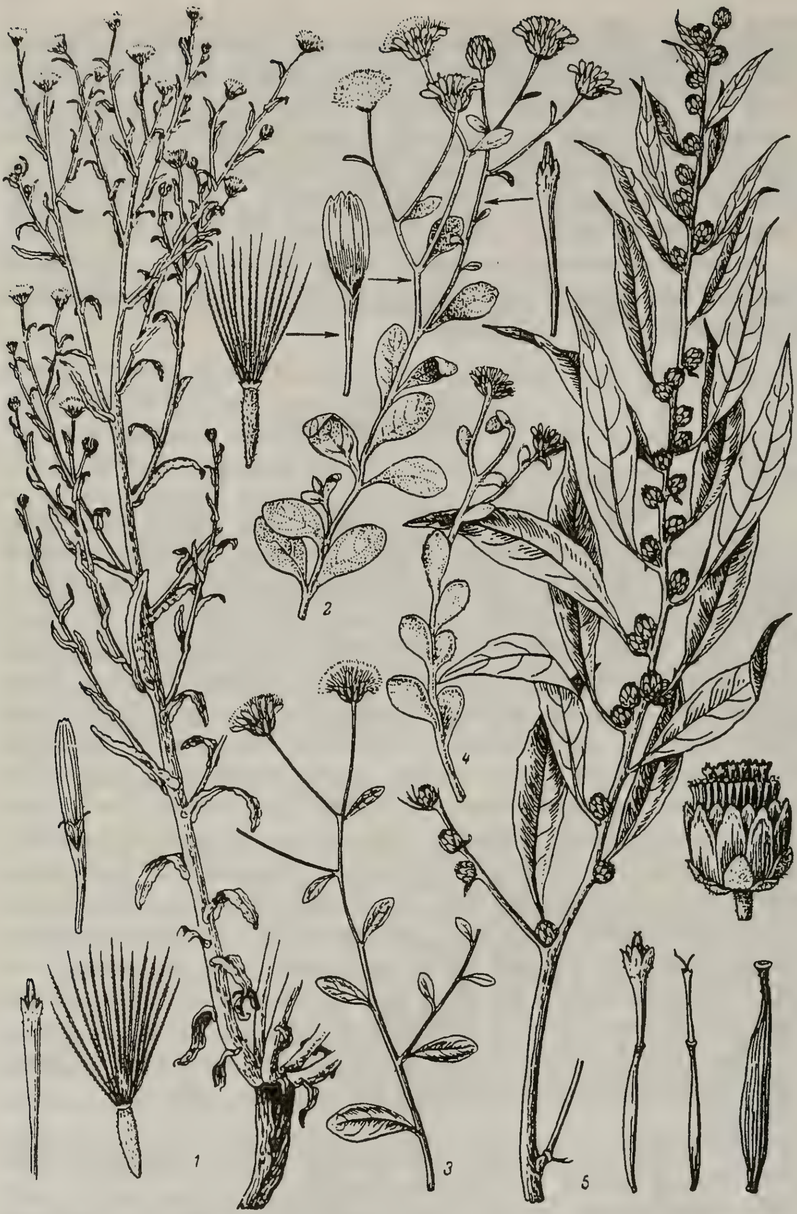
[1] Treatment by V.F. Golubkova.

[2] From the Greek word *karpesion*—straw, because the inner involucral bracts are dry and yellow.



499 Plate XXXI.

1—*Pulicaria gnaphalodes* (Vent.) Boiss., habit of plant, corolla of ligulate floret, corolla of tubular central floret, achene; 2—*P. salviifolia* var. *canescens* Winkl., part of plant, corolla of ligulate floret, corolla of tubular central floret, achenes; 3—*P. salviifolia* var. *glabrescens* Winkl., shoot; 4—*P. salviifolia* var. *lachnophyla* Winkl., shoot; 5—*Carpesium abrotanoides* L., habit of plant, central floret, peripheral floret, achenes.

2. Capitula including bracts 1.5–2.5 cm wide, 5–25(30) on each plant, terminal on stem and branches; outer involucral bracts foliaceous, recurved..1. **C. cernuum** L.

+ Capitula excluding bracts 0.4–0.5 cm wide, 50–250(300) on each plant, subsessile, axillary along branches; outer involucral bracts hardly foliaceous, more or less erect..........4. **C. abrotanoides** L.

3. Capitula 2–3 cm wide, usually terminal, sometimes axillary; flowering branches rather thick, 1.5–2.0 mm thick; petiole usually entire; achenes 6–7 mm long and about 1 mm wide. Plant robust ....2. **C. eximium** Winkl.

+ Capitula 0.8–1.3 cm wide, terminal and axillary, short-pedunculate, flowering branches more slender, about 0.5 mm thick; leaf petioles usually serrate-dentate; achenes about 4 mm long, 0.5–0.7 mm wide. Plant more delicate.........................3. **C. triste** Maxim.

Section 1. CONYZOIDES DC. Prodr. VI (1837) 281; Endl. Gen. Pl. (1836–1840) 452; Maxim. in Bull. Acad. Sc. Pétersb. 19 (1874) 475 and in Mél. Biol. IX, 3 (1874) 281. —Outer involucral bracts more or less recurved. Capitula large, discoid, terminal, closely surrounded by large divergent, recurved, bracteal leaves.

1. **C. cernuum** L. Sp. pl. (1753) 859; M.B. Fl. taur.-cauc. II, 303; DC. Prodr. VI, 281; Ldb. Fl. Ross. II, 618; Maxim. l. c. 478 and l. c. 292; Boiss. Fl. or. III, 214; C. Winkl. in Tr. Peterb. Bot. Sada, XIV, 2 (1895) 61; Schmalh. Fl. II, 48; Kom. Fl. Manchzh. III, 616; Kom. and Alis. Opredel. Rast. Dalnevost. Kr. II, 1023; Grossh. Fl. Kavk. IV, 110; Opredel. Rast. Kavk. 449; Katina in Vizn. Rosl. URSR (1950) 531. —**Exs.**: GRF No. 1733; Fl. exs. Austro-Hung. No. 3442; Fl. It. exs. No. 1375; Fl. Gall. 502 et Germ. exs. No. 256. —**Ic.**: Rchb. Fl. Germ. et Helv Ic. XVI, tab. 92, fig. III, 18–25; Hegi, Ill. Fl. VI, 1, fig. 247.

Perennial. Root densely branched. Stems 30–60 cm high, mostly solitary, erect, longitudinally finely sulcate, branched from middle but not densely; branches erect, divergent, few-leaved, sometimes further branched, stem, particularly in the lower part, and branches soft-pilose or puberulent-villous. Leaves 4–15 cm long (including petioles in lower and middle leaves) and 1.0–3.5 cm wide, elliptical or oblong-lanceolate, along margin shallowly sinuate and sharply denticulate or almost entire, slightly acuminate; lower and middle leaves basally cuneate and decurrent with petiole shorter than lamina; upper leaves sessile with cuneate base; all leaves on both sides, more densely beneath, particularly on midrib and petioles, short, appressed-pilose and finely punctate-glandular. Capitula 1.5–2.5 cm wide, somewhat compact, drooping, solitary on slightly thickened and decurved apex of shoots and stem, surrounded by bracteal leaves considerably exceeding capitula and unequal, like cauline leaves in shape and pubescence, 1–4(7) cm long, 2–8(13) mm wide. Outer involucral bracts oblong, 8–13 mm long, about 2 mm wide, foliaceous, recurved, acute, pubescent on both sides, more densely outside, and punctate-glandular; middle bracts in lower, yellowish, coriaceous, glabrous part 8–11 mm long, about 3 mm wide, in upper part foliaceous, recurved, subacute and pubescent on both sides; inner bracts 7–8 mm long, 3 mm wide, oblong-spatulate, coriaceous, yellow, obtuse and slightly erose-toothed, glabrous; peripheral florets three- to seven-rowed, with about 2 mm long corolla, almost one-third as long as ovaries and three times as long as achenes, with very short, scarcely visible tube and expanded limb, five-toothed at apex and sparsely glandular, style exserted; disk florets considerably more numerous, with corolla about 2.5 mm long, half as long as ovaries, with expanded limb, two times as long as tube, apically five-toothed and glandular, style branches and anthers exserted. Achenes 5–6 mm long, about 0.75 mm wide, fusiform, three-angled, longitudinally shallowly sulcate, rostrate, terminating in scutellate areola, with distinctly cartilaginous and thickened border. Flowering VII–IX.

Forest and scrubs, stony moist places, roadsides. —*European Part*: Upper Dniester, Middle Dniester (Podolia); *Caucasus*: Dagestan, western, eastern, and southern Transcaucasia, Talysh; *Far East*: Ussuri, *Soviet Central Asia*: Syr-Darya. *General distribution*: Central Europe, western Mediterranean, Balkans-Asia Minor, Indo-Himalayas, Dzhungaria-Kashgaria, Tibet, Japan, China, Korea. Described from Italy. Type in Berlin.

2. **C. eximium** C. Winkl. in Tr. Peterb. Bot. Sada, XIV, 2 (1895) 58; Kom. and Alis. Opredel. Rast. Dalnevost. Kr. II (1932) 1023.

503 Perennial. Plant large; root sturdy, densely branched. Stems solitary, 30–120 cm high, thick, about 8 mm wide below, branched above, but not strongly; branches not many; stem and branches, particularly in upper part, not long-pilose and punctate-glandular, stem often almost glabrous below. All leaves 8–23 cm long and 3–15 cm wide, irrespective of length of petiole of lower and middle leaves; lower and middle leaves ovate-lanceolate, coarsely and irregularly dentate-serrate, acute, basally round, on entire-margined (1)2–4 cm wide petioles, broadly winged in upper part, cuneately narrowed at base, 5–15 cm long, much shorter than lamina; upper leaves oblong, less deeply dentate or almost entire, with broadly cuneate base and acute apex, sparsely pubescent above with short appressed hairs, somewhat more densely beneath besides being punctate-glandular. Capitula 2–3 cm wide, drooping, on thick decurved tips of branches and stem, surrounded by bracteal leaves, dissimilar to each

other but like upper cauline leaves in shape and pubescence, 0.8–10.0 cm long, 0.2–4.0 cm wide. Involucre hemispherical; outer bracts much longer, 1.2–2.7 cm long, 2–8 mm wide, foliaceous, recurved, oblong-lanceolate, acute, on both sides puberulent, glandular outside with small punctate glands; middle bracts 0.9–1.7 cm long, 5–6 mm wide, coriaceous, oblong, with recurved acute foliaceous apex, outwardly puberulent and glandular with minute punctate glands, inside pubescent only at apex or subglabrous; inner bracts coriaceous, 8–10 mm long, 2–3 mm broad, oblong spatulate, obtuse, ciliate-fimbriate, pubescent outside only in upper part; innermost bracts linear-lanceolate to almost filiform, 7–9 mm long, acute, only at apex finely ciliate. Peripheral pistillate florets smaller than disk florets, with about 3 mm long corolla, half as long as ovary, more or less cylindrical, apically five-toothed; corolla of disk florets about 4 mm long, somewhat shorter than ovary, also more or less tubular and apicially five-toothed, with less exserted style branches; corolla of all florets sparsely glandular outside at apex. Achenes 6–7 mm long and about 1 mm wide, somewhat compressed, rostrate with beak glutinous, terminating in scutellate areola, with border distinctly cartilaginous and thick. Flowering VII–IX.

Forests. —*Far East*: Ussuri. *General distribution*: China, Korea, Tibet. Described from Szechuan Province. Type in Leningrad.

3. **C. triste** Maxim. in Bull. Acad. Pétersb. XIX (1874) 479; Mél. Biol. IX, 3 (1874) 287; Winkl. in Tr. Peterb. Bot. Sada, XIV, 2 (1895) 59; Kom. and Alis. Opredel. Rast. Dalnevost. Kr. II, 1023; Kom. Fl. Manchzh. III, 617, 620. —*C. manshuricum* Kitamura in Mem. Coll. Sci. Kyoto Imp. Univ. ser. B, XIII (1937) 280. —**Ic.**: Jap. Bot. Ill. Album. (1933) 1446.

504 Perennial. Root small, strongly branched. Stems 30–80 cm high, branched from middle; branches erect, divergent, short, almost always leafless, except for bracteal leaves surrounding capitula, either sparsely leafy or secondarily short-branched; stem and branches pilose and partly, particularly upwards, punctate-glandular. Lower and middle cauline leaves 6–11(15) cm long (excluding petiole), 5–10(11) cm wide; lower leaves ovate-oblong, acuminate, basally round, petiolate, petioles longer than lamina, 9–15 cm long, in upper part broadly winged, 1.0–1.5 cm wide, cuneately decurrent below, along margin of lamina and petiole coarsely toothed-serrate; middle leaves oval-lanceolate, attenuate at tip, basally round, on short cuneately tapering 2–4 cm long petioles; uppermost leaves 3.5–9.0 cm long, 0.4–3.0 cm[†] wide, linear-lanceolate, on both sides cuneately

narrowed; middle and upper leaves inconspicuously toothed to entire; all leaves on both sides covered with scattered appressed hairs, more densely beneath, particularly along midrib, sometimes, also finely punctate-glandular. Capitula somewhat flat, 0.8–1.3 cm wide, terminal on thickened and decurved stem and branches, surrounded by unequal, linear-lanceolate bracteal leaves, 7–20 mm long, 1.5–2.5 mm wide, slightly or three times as long as capitulum, pubescent like cauline leaves. Involucral bracts 5–7 mm long, 1–2 mm wide; outer bracts foliaceous, recurved, linear, on both sides sparsely pubescent and with fine glands; middle bracts oblong-spatulate, scarious, yellow-greenish, with foliaceous, acuminate, recurved and also outwardly pubescent apex; inner bracts longer and narrower, spatulate, coriaceous, yellow, greenish in middle, apically erose, glabrous; innermost bracts linear-lanceolate, subacute, glabrous. Corolla of outer florets about 2.5 mm long, half as long as ovary, almost tubular; style branches scarcely exserted; central florets fewer, with corolla about 3.5 mm long, scarcely shorter than ovary; anthers slightly inflated toward tip with exserted apices; style branches included; all corollas sparsely glandular outside at apex. Achenes about 4 mm long, 0.5–0.7 mm wide, more or less cylindrical, finely sulcate, on beak and at very base finely glandular, tuberculate, the beak terminating in scutellate areola with cartilaginous border. Flowering VII–VIII.

Larch and mixed forests. —*Far East*: Ussuri. *General distribution*: Northern China, Korea, Japan. Described from Japan from Yezo Island (Hokkaido). Type in Leningrad.

Section 2. ABROTANOIDES DC. Prodr. VI (1837) 282; Endl. Gen. pl. (1836–1840) 452; Maxim. in Bull. Acad. Sc. Pétersb. 19 (1874) 475 and in Mél. Biol. IX, 3 (1874) 281. —All involucral bracts appressed or outermost bracts slightly recurved; capitula small, ovate-oblong, usually
505 solitary, without or sometimes with small bracteal leaves, short-pedunculate or subsessile, in axils of leaves along almost entire length of branches in racemose inflorescences.

4. **C. abrotanoides** L. Sp. pl. (1753) 860; DC. Prodr. VI, 182; M.B. Fl. taur.-cauc. II, 303; Ldb. Fl. Ross. II, 618; Maxim. op. cit. 481 and op. cit. 292; Boiss. Fl. or. III, 215; Grossh. Fl. Kavk. IV, 110; Opredel. Rast. Kavk. 49. —*C. wulfenianum* Schreb. in DC. l. c. —*C. racemosum* Wall. in DC. l. c. —*C. wulfenii* Schreb. apud Schrank in Flora (1827) 1, 62. —*C. thunbergianum* Sieb. and Zucc. Fl. Jap. Fam. Nat. II (1846) 187. —*C. wulfenianum* Schreb., in Bertol. Fl. Ital. IX (1853) 173. —**Exs.**: Herb. Fl. Cauc. No. 294. —**Ic.**: Rchb. Fl. Germ. XVI, tab. 983; Javorka, Ic. Fl. Hung. (1934) 516; Jap. Bot. Ill. Album (1933) 1444.

Perennial. Root sturdy, densely fibrous. Stems 50–80 cm high, quite thick, paniculately branched in upper half; branches long, virgate, up to tip leafy, lower branches upright-divergent, upper branches or all of them more or less appressed toward stem; stems pilose, more densely pilose upwards and on branches and mostly, besides, punctate-glandular. Leaves oblong, 3–18(22) cm long, 0.5–4.5(6.5) cm wide (upper leaves narrower), irregularly and very abruptly serrulate-dentate to indistinctly toothed and entire, with both ends narrowly cuneate, acute; lower leaves decurrent on short petiole, upper almost sessile; all leaves on both sides covered with appressed, scattered hairs and, besides, punctate-glandular beneath. Capitula numerous, small, 4–7 mm wide, ovoid-oblong, somewhat compressed, borne densely almost secund, in ones, or rarely twos, in leaf axils along branches and branchlets, on very short single-flowered [sic.][†] peduncles or almost sessile, initially erect, later drooping, usually without or with minute oblong bracteal leaves, 4–10 mm long, 1–2 mm wide, pubescent like cauline leaves. Outer involucral bracts one to four, almost appressed or sometimes (outermost) weakly recurved, linear or oblong, entirely or sometimes in upper part foliaceous, 2–4 mm long, 0.5–1.5 mm wide, pubescent on both sides, less densely inside; middle bracts larger, broadly ovate, about 3 mm long, about 2 mm wide, obtuse, in lower part coriaceous and glabrous, in upper, foliaceous, pubescent on both sides but along margin ciliate-fimbriate; inner bracts coriaceous, oblong, 4–5 mm long, 2–3 mm wide (innermost bracts much narrower), glabrous, obtuse and slightly fimbriate at apex. Peripheral florets with filiform corolla, about 1.5 mm long, almost half as long as achenes, central florets fewer, with corolla about 2.5 mm long, almost as long as achenes, with somewhat expanded limb, anther apices exserted; corolla
506 of all florets with few pellucid glands outside at apex; style branches of all florets scarcely exserted. Achenes about 3 mm long, filiform, longitudinally finely sulcate, beak glutinous, apically enlarged into shallowly infundibular areola, with a cartilaginously thickened margin. Flowering VII–IX. (Plate XXXI, Fig. 5).

Forests, forest edges, shady places. —*Caucasus*: Western and eastern Transcaucasia, Talysh. *General distribution*: Central Europe, western Mediterranean, Italy, Balkans-Asia Minor (Yugoslavia), Iran, Indo-Himalayas, Dzhungaria-Kashgaria, China, Korea, Japan, Tibet. Described from China. Type in Berlin.

Note. This species is treated here in the broad sense, without differentiating forms according to the size of the capitula and width of the leaves. Further study with more material is needed.

[†] Should be "single-headed."—Translators.

GENUS 1502. **Adenocaulon** Hook.[1,2]

Hook. Bot. Misc. I (1830) 19; DC. Prodr. V (1836) 207; Benth. and Hook. Gen. pl. II, 344

Capitula small, few-flowered and few, terminal on stem and branches in lax panicles; involucral bracts few, one-rowed, almost equal, often decurved, small, somewhat longer or shorter than florets, thin foliaceous; receptacle glabrous, very short-conical or flat; florets few, whitish, peripheral florets pistillate, fertile, one-whorled, with very short tube and 4–5-fid limb, central florets staminate, sterile, many-whorled, with narrow long tube and five-fid limb; anthers with very short basal and apical appendages exserted from corolla; style of peripheral florets with two broadly obtuse, short branches, of central florets, almost capitate; achenes oblong-clavate, slightly compressed above, indistinctly longitudinally ribbed, like entire plant covered with stalked glands, stellately borne without pappus. Perennial herbs with weakly branched, erect stems, leafy mainly in lower part, white-tomentose or arachnoid hairy in inflorescence, besides with stalked glands; basal and cauline leaves alternate, coarsely toothed or almost entire, on long petioles (particularly lower leaves), broadly or quite narrowly winged, white-tomentose beneath.

Of the five (or four) species growing in eastern Asia, North and South America, one is found in our area.

507 *Series* 1. Dentata Golubk. —Leaves rotund-reniform or deltoid, sinuously, unevenly toothed, the short teeth sharp-pointed. Besides *A. adhaerescens* Maxim., we refer the North American species *A. bicolor* Hook. and the Himalayan species *A. hymalaicum* Edgew. to this series.

1. **A. adhaerescens** Maxim. Prim. Fl. Amur. (1859) 152; Kom. Fl. Manchzh. III (1907) 620; Kom. and Alis. Opredel. II (1932) 1024. —**Ic.**: Somoku, Dzusetsu, Ed. 2, XVII (1874) tab. 47.

Perennial. Stems 30–80 cm high, erect, thick, sulcate, simple or with short branches above, arachnoid or white-tomentose and in inflorescence, also with dense stalked glands, often almost glabrous below. Lower leaves with rotund-reniform lamina, (3)5–8 cm long, (4)6–10 cm wide, with coarsely irregular and very abruptly sharp-pointed teeth and fine teeth between them, petiole longer than lamina, (0.5)1.0–1.5(2.0) cm wide, winged and usually unequally coarse-toothed; middle leaves deltoid-

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[1] Treatment by V.F. Golubkova.

[2] From the Greek words *aden*—gland, and *caulos*—stem (named for the glandular pubescence of the stems).

rotund, 9–13 cm long, 11–16 cm wide, on winged, narrower and less toothed, rarely entire, basally expanded petiole, as long as lamina or somewhat shorter; upper leaves usually smaller, with laminae 1–4 cm long, 1.5–5.0 cm wide, deltoid-rotund, unevenly toothed, on short winged petioles; uppermost ones linear, 0.5–1.5 cm long, 0.1–0.5 cm wide, subsessile, entire; all leaves more or less glabrous above, only along veins covered with sessile or short-stalked glands and sometimes weakly puberulent, grayish-tomentose or arachnoid beneath. Inflorescence narrowly paniculate, grayish-tomentose and glutinous with black stalked glands, lateral branches 2–10(15) cm long, more or less appressed toward stem or somewhat divergent, often flexuous and recurved at ends, more or less straight at fruiting; bracteal leaves sessile at base or above on peduncles, (0.3)0.5–0.7(1.0) cm long, 0.5–1.0 mm wide, linear or linear-oblong, entire, on both sides glabrous or weakly arachnoid-hairy beneath, on fruiting; up to 1.5 cm long. Capitula at anthesis about 5 mm wide, about 1 cm at fruiting; involucral bracts five to seven, broad-ovate, 2.5–3.5 mm long, about 2 mm wide, with fine parallel veins, glabrous or weakly tomentose outside, decurved at fruiting; receptacle very short conical, alveolate; pistillate peripheral florets 6–12, whitish with 2.0–2.5 mm long corolla, almost as long as obovoid glutinous ovary, densely covered with stalked glands, limb longer than tube, broad campanulate, four- or five-fid, with oval-oblong, subacute lobes, sterile stamens appressed toward style and much shorter, four, style branches exserted, very finely tuberculate inside (visible only under high magnification); central [disk] florets staminate, 7–23, somewhat longer than pistillate florets, whitish, with about 2.5–3.0 mm long corolla, almost three times as long as sterile glabrous ovary, limb half as long as tube, with oval-
508 oblong, subacute lobes; anthers exserted, slightly shorter than style. Achenes 7–8 mm long, 1.5–2.0 mm wide, blackish-green, covered with thick, stalked glands above. Flowering VII–VIII.

Forests, near streams, moist ravines, riverbanks and valleys, wet places. *Far East*: Uda River area, Ussuri. *General distribution*: China, Japan, Korea, Tibet. Described from Lower Amur. Type in Leningrad.

Subtribe 6. **BUPHTHALMINAE** O. Hoffm. in Pflanzenfam. IV, 5 (1889–1894) 206. —Capitula heterogamous with ligulate peripheral florets; anthers with sagittate or caudate basal appendages; receptacle with membranous scales.

GENUS 1503. **Pallenis** Cass.[1, 2]

Cass. in Dict. Sc. nat. XXIII (1822) 566; XXXVII (1825) 275; DC. Prodr. V (1836) 487; Benth. and Hook. Gen. pl. II, 340. —*Asteriscus* Sch. Bip. in Webb, Phytogr. Canar. II (1835–1860) 229

Capitula medium or large, many-flowered, solitary, terminal. Involucre hemispherical, two- or three-rowed, imbricate; bracts unequal, spinescent, outer foliaceous, considerably longer than inner coriaceous bracts. Receptacle convex, covered with grooved scales surrounding achenes. All florets fertile; peripheral florets two-rowed, pistillate, narrowly ligulate, apically three-toothed, with three-angled, winged tube; central florets bisexual, many-whorled, tubular, tube somewhat broad, weakly three-angled and winged on inner side, limb five-fid; anthers with caudate basal appendages; style branches linear, somewhat flat, obtuse. Outer achenes flat, weakly three-angled, winged, with two lateral wings and third ventral wing; central achenes flattened laterally, more or less three-angled, all achenes pubescent; pappus of one row of short bristles, basally connate, forming short toothed-ciliate corona, in peripheral florets often one-sided. Annual herbs, almost sericeous-lanate, with opposite, entire leaves.

The genus comprises four species, three of which grow in North America, and the fourth is found also in Europe, the Caucasus, Asia Minor, Central Asia, and Iran.

1. **P. spinosa** (L.) Cass. in Dict. Sc. nat. XXXVII (1825) 276; DC. Prodr. V, 487; Ldb. Fl. Ross. II, 512; Boiss. Fl. or. III, 180; Grossh. Fl. 509 Kavk. IV, 110; Opredel. Rast. Kavk. 449; Schmalh. Fl. II, 53. —*Buphthalmum spinosum* L. Sp. pl. (1753) 1274; M.B. Fl. taur.-cauc. II, 340. —*Asteriscus spinosus* Sch. Bip. in Webb. Phytogr. Canar. II (1835–1860) 230. —**Ic.**: Rchb. Ic. Fl. Germ. XVI, 938, 939.

Annual. Entire plant covered (more densely above) with erect, soft, long and fine hairs, almost sericeous or lanate. Stems usually numerous, sometimes solitary, 20–60 cm high, lax, corymbosely branched above or simple. Basal and lower cauline leaves oblong-spatulate, 5–10 cm long, 1.3–2.0 cm wide, rather long-petiolate, apiculate; middle and upper cauline leaves oblong-lanceolate, 2–7 cm long, 0.5–1.5 cm wide, auriculate, semiamplexicaul, spiny-mucronate, spinescent. Outer involucral bracts stellately arranged, 1.5–4.0 cm long, 4–8 mm wide, far exceeding peripheral florets, lanceolate, nervate, foliaceous green, only in lowermost part somewhat tapering, coriaceous and light colored, acute and spiny in upper

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[1] Treatment by V.F. Golubkova.

[2] From the Latin word *palea*—scale (named for the squamose receptacle).

part; inner bracts much shorter, 5–8 mm long and 2.0–2.5 mm wide, slightly shorter than ligulate florets, oblong, usually coriaceous and light colored, in upper part foliaceous, green, acute, also spiny, gradually transitional to grooved receptacular scales; all bracts pubescent except inner lower coriaceous part. Ligulate florets yellow, slightly longer than inner involucral bracts, with 9–12 mm long corolla, tube about 1 mm long, along wings and much shorter median keel on inner side finely and appressed ciliate; ligules linear, 8–11 mm long and 2.0–2.5 mm wide; tubular central florets considerably shorter than peripheral florets, corolla tube about 3 mm long and limb about 1 mm long, glabrous; style short, with exserted branches. Receptacle squamose, scales mucronate-acuminate, enclosing florets, oblong-linear, 7–8 mm long and 2.0–2.5 mm wide, light colored, stiff, outermost scales two-fifths as long as ligulate florets, flat, inner scales much shorter and narrower, not longer than corolla tube of disk florets, grooved, keeled. Outer achenes about 3 mm long and 2 mm wide (including lateral wings), with small, about 0.25–0.33 mm long corona, usually absent on inner side, along margin of lateral wings and outside, in middle covered with short, appressed cilia and hairs, central achenes about 2.5 mm long and 1 mm wide, with small, about 0.33 mm long annular corona, with occasional short appressed hairs on entire surface and margin of wing. Flowering V–VI.

Dry meadows, edges of fields, in weedy places, roadsides. *European Part*: Crimea; *Caucasus*: Eastern Transcaucasia, Talysh; *Soviet Central Asia*: mountainous Turkmenia. *General distribution*: Central Europe, Atlantic Europe, western and eastern Mediterranean, Balkans-Asia Minor? Armenia and Kurdistan, Iran. Described from southern France. Type was in Berlin earlier.

510 GENUS 1504. **Telekia** Baumgart.[1,2]

Baumgart., Enum. stirp. Transsilv. III (1816) 149; DC. Prodr. V (1836) 485. —*Buphthalmum* L. Sp. pl. (1753) 1273 p. p. —*Buphthalmum* L. sect. 1 *Telekia* (Baumg.) Fiori in Fiori and Beguinot. Fl. Anal. d'Italia, III (1903–1904) 294

510 Capitula large, many-flowered, terminal, in racemose inflorescence or solitary, peduncles rather long; involucre many-rowed, involucral bracts imbricate, broadly ovate herbaceous, outer longer, sometimes unequal, entire or slightly toothed, inner shorter, ovate, recurved; receptacle weakly convex, squamose; all florets fertile, yellow; peripheral florets pistillate,

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[1] Treatment by V.F. Golubkova.

[2] Baumgarten named this genus in honor of his patron, Count Teleki.

far exceeding involucre, one-whorled, ligules long, linear or oblong, three-toothed; central florets bisexual, many-whorled, with tubular corolla, tapering downward, five-toothed; anther lobes with basal appendages long barbate at apex; style branches linear, rather long, apex round. All achenes somewhat compressed, longitudinally ribbed, peripheral achenes not significantly different from central, cylindrical, three-angled, slightly curved, ribs somewhat closer to each other on ventral side; central achenes cylindrical, four-angled; pappus forming very short cartilaginous corona, apically undulate or irregularly toothed.

Perennial tall herbs with undivided, alternate leaves.

The genus comprises two species distributed in Europe, one of which also grows in Asia Minor.

1. **T. speciosa** (Schreb.) Baumg. op. cit. p. 150; Ldb. Fl. Ross. II, 511; Boiss. Fl. or. III, 178; Grossh. Fl. Kavk. IV, 111; Opredel. Rast. Kavk. 449; Katina in Vizn. Rosl. URSR, 531. —*T. cordifolia* DC. Prodr. V (1836) 485. —*T. ovata* C. Koch in Linnaea, XXIII (1850) 712. —*Buphthalmum speciosum* Schreb. Icon. et descr. plant. minus cognit. Dec. I (1766) 11; Schmalh. Fl. II, 53. —*B. cordifolium* Waldst. and Kit. Ic. pl. rar. Hungar. II (1805) 117; M.B. Fl. taur.-cauc. II, 340; III, 586. —*Inula caucasia* Pers. Syn. II (1807) 450. —*Molpadia suaveolens* Cass. in Dict. Sc. Nat. XXXII (1824) 401. —*Corvisartia caucasica* G. Don ex Loud. Hort. Brit. (1830) 350. —**Exs.**: GRF No. 1778; Fl. Cauc. exs. No. 299; Fl. exs. Austro-Hung. No. 661; Fl. exs. Bohem.-Sloven. No. 77. —**Ic.**: Schreb. l. c. tab. VI; Waldst. and Kit. l. c. tab. 113; Hegi, Ill. Fl. VI, fig. 248 and 249, c, d.

Perennial. Rhizome oblique, nodulose, thick; stems 50–200 cm high, straight, thick, up to 1 cm thick in lower part, solitary, in upper part lax, 511 umbellately branched, longitudinally sulcate-striate, rufescent, with occasional short crisped hairs below, in upper part, also with rather dense, small and sessile glands. Basal leaves 19–25 cm long, 13–17 cm wide, ovate or broadly ovate, basally cordate, sometimes round, on long, narrow, winged, 11–20 cm long petioles; acute; middle cauline leaves 15–20 cm long, 8–15 cm wide, broadly ovate, basally less deeply cordate than basal leaves and on shorter, 1.5–5.0 cm long petioles, dilated, subacuminate; upper leaves 10–20 cm long, 6–12 cm wide, ovate, ovate-oblong, or even ovate-lanceolate, sessile or subsessile, at base round, semiamplexicaul, acuminate; all leaves unevenly serrate-dentate, as also petiole, almost glabrous above or sparsely pubescent with occasional hairs, with occasional fine glands mixed with few simple hairs along margin and beneath. Capitula (one) two to eight on each plant, large, hemispherical; peduncles axillary, 5–25 cm long, at apex slightly swollen; bracteal leaves at base of capitula 3–8 cm long, 1.0–2.5 cm wide, like upper cauline leaves in shape

and pubescence, but much narrow-lanceolate, transitional to outer row of involucral bracts. Involucre 2–4 cm wide (without the outermost row of much longer bracts), 5–10-rowed, imbricate; outermost bracts foliaceous, green, flat oblong, entire or with few scarsely visible teeth, acute, 3.5–4.5 cm long, 1.5–7 mm wide, most unequal, longest of them somewhat shorter than peripheral florets or almost as long, others half or less as long; involucral bracts of next two or three rows of involucre 10-15 mm long, 2–8 mm wide, distinctly shorter than outer, less acute, lanceolate bracts, in lower half scarious and brown, only at apex foliaceous, green, bracts of middle rows broadly oval, scarious, apically round-obtuse or obtuse; innermost bracts narrowly spatulate, almost membranous, somewhat recurved, very short compressed, discontinuously toothed; greenish involucral bracts outwardly and along margin punctate with fine glands, membranous bracts glabrous or subglabrous. Receptacle convex, receptacular scales shorter than corolla, linear, cartilaginous, flat, finely toothed, acute. Corolla of peripheral florets 3.0–4.5 cm long, long and narrowly ligulate, golden yellow, three times as long as involucre (excluding outer longest bracts), five-veined, 1.0–1.5 mm wide, broader in upper half, outwardly covered with very fine lustrous glands, style short, somewhat exserted; corolla of central florets tubular, 5–7 mm long, about 1 mm wide, almost as long as style and stamens, slightly recurved, outwardly, mainly in upper part, covered with fine glands. Achenes about
512 3.0–3.5 mm long, 0.3–0.7 mm wide, almost glabrous, corona of pappus short, scarcely visible, crenate-finely toothed. Flowering VI–VIII.

Edges of montane forests, near forest streams and along riverbanks, in wet places. —*European Part:* Ladoga-Ilmen, Upper Dnieper, Upper Dniester; *Caucasus:* Ciscaucasia, western Transcaucasia, eastern Transcaucasia, southern Transcaucasia. *General distribution:* Central Europe, Balkans-Asia Minor. Described from Cappadocia. Type in Munich.

Tribe 4. **AMBROSIEAE** Cass. in Dict. Sc. Nat. XX (1821) 371, XXIX (1823) 175, LX (1830) 578. —Tribe Ambrosiées Baill. Hist. Pl. VIII (1882) 72. —Tribe Senecioneae subtribe Ambrosieae Less. in Linnaea V (1830) 151, p. p. —Tribe Senecionideae subtribe Ambrosieae Less. Synops. Comp. (1832) 218, p. p. —Tribe Senecionideae subtribe Melampodineae div. V. Ambrosieae and Div. VI Iveae DC. Prodr. V (1836) 498. —Tribe Helianthoideae subtribe Ambrosieae Benth. in Benth. and Hook. f. Gen. Pl. II (1873) 192. —Tribe Heliantheae subtribe Ambrosinae O. Hoffm. in Pflanzenfam. IV, 5 (1889–1894) 220. —Ordo Ambrosiaceae Link, Handb. I (1829) 816. —Capitula heterogamous or unisexual. Receptacle glabrous or with few scaly or filiform appendages, or receptacle squamose. Pistillate florets often almost or completely lacking perianth, style of these florets deeply bifid; in staminate florets anthers almost or completely free, filaments fused, forming staminal tube but pistil undeveloped. Achenes glabrous, without pappus, free or enclosed in connate and hardened involucre. Leaves usually alternate.

Herbs, semishrubs, or shrubs, mostly American.

KEY TO GENERA OF THE TRIBES AMBROSIEAE, HELIANTHEAE, HELENIEAE[1]

1. Plants monoecious; capitula unisexual, staminate capitula many-flowered, pistillate with one or two florets lacking corolla; achenes enclosed in hardened involucre, connate almost up to apex, falling together..........2

+ Capitula usually with bisexual central florets and pistillate or sterile peripheral florets; involucral bracts free, not enclosing achenes (but could be enclosed in convolute bracts)..........3

++ Achenes free, 6–11 mm long, 0.5–1 mm wide, pilose; pappus of scales..........**Tagetes** L.

2. Capitula bearing staminate florets in capitate inflorescence; fruit ("pseudo") oval, bicornuate in upper part, covered with uncinate spines, two-seeded..........1507. **Xanthium** L.

+ Capitula bearing staminate florets in terminal spicate inflorescence; fruit (pseudo) one-seeded, without spines, but covered with bristles and outgrowths in middle..........1506. **Ambrosia** L.

513 3. Leaves alternate[2]..........4

+ Leaves opposite..........8

4. Semishrub with leaves silvery pubescence (to tomentose), on both sides; laticiferous plant..........***Parthenium** L.

+ Annual herbs; if perennial, then leaves glabrous or subglabrous, but not gray from dense pubescence; plant not laticiferous..........5

5. Receptacle flat or somewhat convex..........6

+ Receptacle conical to cylindrical..........7

6. Capitula 2.5–3.5 cm wide; stem strongly branched from base, ascending or erect, somewhat slender; lower leaves pinnatifid to pinnate..........***Laya** Hook. and Arn.

+ Capitula larger; stem erect, usually simple, thick, with loose pith; all leaves undivided..........1510. **Helianthus** L. (*H. annuus* L.)

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[1] Compiled by I.T. Vassilczenko.

[2] Here and hereafter, the middle cauline leaves are the ones in question.

7. Ligulate florets usually yellow or orange, sometimes red; bracts soft, acute, but not subulate-acuminate and stiff, not spiny .... ***Rudbeckia** L.
+ Ligulate florets usually purple or crimson; bracts stiff, spiny, at apex subulate-acuminate................................ ***Echinacea** Moench
8. Leaves compound, pinnatifid or pinnate; if simple, then lamina cuneate, apically with two to four awns, covered with backward directed bristles..9
+ Leaves simple; lamina with two to four awns, covered with bristles..13
9. Perennials, usually with short nodose rhizomes........................10
+ Annual plants with slender root..11
10. Plants with nodose rhizomes; achenes 9–12 mm long.................. ....***Dahlia** Cav.
+ Plants without tubers; achenes 2–3 mm long........................ ....***Coreopsis** L. (Perennial forms)
11. Achenes boat-shaped, impressed, and marginate or fusiform, 2.3–2.7 mm long, 0.7–1.0 mm wide.........***Coreopsis** L. (Annual forms)
+ Achenes of another shape; if fusiform or narrowly linear, then much longer, 6–12 to 20(25) mm long.......................................12
12. Bracts attenuated into filiform tips. Cultivated (ornamental) plant ....***Cosmos** Cav.
+ Bracts not attenuated into filiform tips. Wild plant................... ....1511. **Bidens** L.
514 13. Leaves sessile, sometimes more or less amplexicaul....................14
+ Leaves distinctly petiole..17
14. Involucre one-rowed, densely covered with stalked glands; receptacle with one row of bracts enclosing inner achenes.................. ....***Madia** Mol.
+ Involucre two- or many-rowed, imbricate, not covered by stalked glands; bracts spread over entire surface of receptacle.................15
15. Involucre many-rowed; imbricate; bracts stiff, almost coriaceous, at apex blackish; peduncles clavate..............................***Zinnia** L.
+ Involucre two-rowed; outer involucral bracts herbaceous, inner thin membranous; bracts not blackish at apex; peduncles not clavate..16
16. Capitula 6–8 mm wide; ligulate florets white. Wild (weedy) plant ....1509. **Eclipta** L.
+ Capitula 2–5(6) cm wide; ligulate florets yellow. Cultivated plant ....**Guizotia** Cass.
17. Perennial plant..18
+ Annual plant with slender root..19

18. Ligulate florets pistillate, persisting at apex of achenes; receptacle convex to conical..***Heliopsis** Pers.

+ Ligulate florets soft, deciduous (with seeds); receptacle flat or weakly convex.................1510. **Helianthus** L. (Perennial species).

19. Peripheral florets pistillate, fertile, without perianth; central florets bisexual but sterile.........................1505. **Cyclachaena** Fresen.

+ Peripheral florets pistillate, with perianth; ligulate inner florets bisexual, fertile..20

20. Bracts apically fimbriate or three-fid; pappus (of peripheral achenes) of ciliate long scales well developed..1512. **Galinsoga** Ruiz. and Pav.

+ Bracts tapering at apex, not fimbriate; pappus absent or of three awns in outer achenes..21

21. Outer involucral bracts divergent, densely glandular; receptacle flat. Wild (weedy) plant............................1508. **Siegesbeckia** L.

+ Outer involucral bracts appressed, eglandular; receptacle convex. Cultivated (ornamental) plant.............................***Sanvitalia** Gualt.

Subtribe 1. **CYCLACHENINAE** Kirp. stat. and nom. nov. h. 1. —Tribe Iveae Rydb. in North Amer. Fl. 33 (1922) 3. —Capitula heterogamous, bearing marginal pistillate florets, often without perianth, and inner, 515 tubular-campanulate, sterile florets. Achenes free.

GENUS 1505. **Cyclachaena** Fresen.[1, 2]

Fresen. in Ind. Sem. Horti. Frankof. (1836) 4; Fresen. in Linnaea XII (1838) Suppl. 78. —Sect. *Cyclachaena* (Fresen.) A. Gray (generis Iva) Syn. Fl. North Amer. I, 2 (1884) 245.

Capitula small, heterogamous, without bracteal leaves, pedunculate or almost sessile, usually nodding, hemispherical, solitary or in twos or threes in spicate inflorescences, forming pyramidal panicles at apices of branches or in axils of upper leaves. Involucre hemispherical, two-rowed, of 10 bracts; inner involucral bracts compactly enclosing pistillate florets. Receptacle flat, glabrous or with few scales. Peripheral florets pistillate, few, up to five, without or with rudimentary perianth; style short; stigma deeply bifid, stigma lobes linear, flat. Central florets bisexual, 10–15, sterile, with tubular-campanulate corolla, greenish-white; ovary absent; anthers free, at apex bent, stigma not divided, hemispheri-

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[1] Treatment by L.A. Smoljaninova.

[2] From the Greek words *cyclos*—circle, and *achena*—seed (named for the shape of the seeds in this plant).

cal, radiately racemose. Achenes small, obovoid, glabrous, without pappus. Annual herbs with opposite or upper alternate, entire, leaves, serrate-toothed or dissected.

An American genus of four species [referred by Grimm to Section *Cyclachaena* (Fresen.) A. Gray of the genus *Iva* L.]; one species is introduced in the USSR.

The genus *Cyclachaena* differs from *Iva* L. by having a two-rowed involucre of 10 bracts, pistillate florets with the corolla reduced or absent, numerous staminate florets without a rudimentary ovary, and an almost glabrous receptacle with two or three small, linear scales. Representatives of the genus *Iva* L. have an involucre of three to five, uniseriate bracts (in section *Eu-iva* bracts six to nine, in two to four rows) pistillate florets with a clearly developed tubular corolla, staminate florets with a rudimentary ovary, and a receptacle with linear or linear-spatulate scales.

1. **C. xanthifolia** (Nutt.) Fresen. in Ind. sem. Horti Franc. (1836) 4. — *Iva xanthifolia* Nutt. Gen. I (1818) 185; DC. Prodr. V, 529; Gray Syn. Fl. North Amer. I, 2, 245; Hoffm. in Pflzfam. IV, 5 (1894) 221; Sorn. rast. SSSR IV (1935) 264; Vizn. Rosl. URSR, 531. —**Ic.**: Gaertn. De Fruct. 2, 394, tab. 164. —**Exs.**: GRF No. 1329.

516 Annual. Stem 30–200 cm high, erect, ribbed, simple or branched, glabrous below, more or less strongly pubescent above. Leaves in size and shape like cocklebur. 4.5 to 10.0 cm long and 3.0–6.5 cm wide, opposite, on 3 to 9 cm long petioles, tapering toward base, sometimes round, acuminate, narrowly attenuate, cordate-ovate or broadly ovate, upper leaves ovate, three-veined, margin serrate-toothed, scabrous above from short setaceous hairs, grayish beneath from dense sericeous tomentum of longer setaceous hairs. Capitula 2–4 mm wide, numerous, heterogamous, almost sessile, drooping, solitary or in twos or threes, in narrow spicate inflorescence or racemose forming large lax paniculate inflorescence, terminal or in axils of upper leaves. Involucre hemispherical, compressed, 4 mm wide, of 10 bracts, two-rowed; outer bracts 2–3 mm long and 2.0–2.5 mm wide, obovate or broadly obovate, somewhat acuminate flat, herbaceous, pubescent, with long occasional glandular hairs along margin; inner bracts 2 mm long and 1.5 mm wide, membranous, glabrous, broadly obovate, at apex truncate, strongly concave, firmly enclosing pistillate florets during maturation of achenes. Receptacle flat, almost glabrous, with two or three small, linear scales. Peripheral florets pistillate, fertile, five, with perianth reduced to a small ring; style 0.5–1.0 mm long, narrow, glabrous; stigma deeply bifid, with 0.5 mm long, lanceolate lobes, somewhat obtuse, glabrous; ovary 1.5 mm long, 1 mm wide, obovoid, initially with occasional, long, glandular, pointed hairs, later glabrous. Central florets bisexual, sterile, 10–15, 2 mm long, with

obconical five-toothed corolla; corolla lobes small, somewhat bent; anthers free, ovoid-oblong, with apical bent appendages, filaments flat, wide, glabrous; style as long as corolla; glabrous; stigma almost clavate, flat, radiate, racemose, ovary abortive. Achenes 2–3 mm long, 1.2–1.5 mm wide, obovoid, slightly flattened, at apex round with persistent style, and four inconspicuous ribs, glabrous, without pappus, dark brown. Flowering VII–IX.

Weed found along railway embankments and cuts, roadsides, near fences and houses, vacant lands and dumps, rarely pastures, ranges, cultivated fields and gardens. *European Part*: Middle Dnieper, Volga-Don, Lower Don; *Far East*: Ussuri. *General distribution*: Western states of North America, introduced in central Europe. Described from America. Type in Germany.

Note. In the seventies of the last century, this species was introduced into the Kiev Botanical Garden, from where it spread over almost the entire Ukraine, and it also penetrated the borders of the Kursk and Voronezh regions, the northern part of the Rostov Region, the Moldavian SSR (Soroka), the Stavropol Territory and, finally, to the Far East (city
517 of Voroshilov). Marsh-elder [*Cyclachaena*] mixed with hay causes gastric diseases in cattle, while the pollen grains, produced in large quantities, cause hay fever. This plant was included in the list of weeds of quarantine significance because of its harmful properties and prolific seed production. According to S.V. Golitsyn (*Sov. Botanika,* 1947, 15, No. 2), clotbur [*Cyclachaena xanthifolia*] does not infest field crops, vegetable fields and gardens and is a typical weed of railway lines. Therefore, in his opinion, in the USSR, this species can be deleted from the list of objects of quarantine significance.

Subtribe 2. **AMBROSIINAE** O. Hoffm. in Pflanzenfam. IV, 5 (1889–1894) 220, p. p. (sub. Helianthesis). —Tribe Ambrosieae Rydb. in North Americ. Fl. 33 (1922) 13. —Capitula unisexual; achenes one or two or more, enclosed in locules of fused and hardened involucre.

By habit and structure the Ambrosiinae differ quite sharply from the rest of the Compositae. Therefore, at the beginning of the 19th century, some authors considered it necessary to segregate them in the separate family Ambrosiaceae (see Dumortier, 1829; Link, 1829). Later, some authors (Ch. Bessey, 1915; Rydberg, 1922) also split off the Ambrosiaceae, but included the Cyclaceninae.

GENUS 1506. **Ambrosia** L.[1,2]

L. Sp. pl. (1753) 987; DC. Prodr. V (1836) 525; Torrey and Gray, Flora of North Amer. II (1841) 289; Gray, Syn. Fl. of North Amer. I, 2 (1884) 248; Hoffmann in Pflanzenfam. IV, 5 (1894) 221; Sorn. Rast. SSSR, IV, 213

Capitula small, unisexual, staminate in terminal, slender, racemose or spicate inflorescences, 5–18 cm long; pistillate florets solitary or in clusters of two to five at base of inflorescence in axils of bracteal leaves or in axils of upper leaves. Involucre of staminate capitula compressed, scutellate or hemispherical, of 5–12 fused bracts, 5–12-lobed or truncate. Receptacle flat, glabrous or with few filiform appendages. Staminate florets small, 5–26, tubular, with infundibuliform or campanulate, five-toothed corolla, white or light yellow; anthers almost free, with setaceous apical appendages, initially curved but later straight; style filiform; stigma not divided, fimbriate or radiate-racemose, ovary abortive or reduced. Pistillate florets without perianth, each floret separately enclosed in involucre connate up to tip, ovoid, globose-ovoid, oblong or turbinate, 518 apically attenuate into a rostrum or rostellately acute, entire or with few teeth, setose with 4–8 short-acute outgrowths in a row in middle along circumference, spines or tubercles, basally fused with bracts; stigma bifid, with filiform lobes. Achenes ovoid or obovoid, without pappus, enclosed by fused involucre, hardened during maturation of achenes. Annual or perennial herbs, sometimes semishrubs, hispid, with opposite or alternate leaves, pinnatifid lobes, rarely undivided, toothed.

Of the 30 species of this genus growing in North, Central, and South America as well as in the West Indies (Haiti), 4 species are introduced in the USSR as weeds, of which *A. artemisiifolia* L. is the most widely distributed.

1. Involucre of staminate capitula without ribs, with indistinct radiate venation; receptacle with filiform or sometimes broad scales; leaves opposite or and alternate, pinnately divided or bipinnatifid 2

+ Involucre of staminate capitula three-ribbed, receptacle glabrous; leaves opposite, palmate, three to five-lobed, something undivided, toothed.. 3

2. Annuals; leaves bipinnatifid, weakly pubescent; involucre enclosing achenes with four to six acute, spine-like appendages, at apex with short rostrum, glabrous or in lower part pubescent.......... .... 1. **A. artemisiifolia** L.

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[1] Treatment by L.A. Smoljaninova.

[2] Mythical name for the food of the gods; used by the ancients to designate various plants.

+ Perennials; leaves pinnately divided, with dense, setaceous, appressed pubescence; involucre enclosing achenes with four obtuse tubercles, apically truncate, in upper part pubescent..2. **A. psilostachya** DC.

3. Petioles dilated at base, long-ciliate; involucre enclosing achenes, 6–12 mm long, obovoid, with coarse teeth...........3. **A. trifida** L.

+ Petioles not dilated at base, without long-ciliate hairs; involucre enclosing achenes, 4–6 mm long, elliptical, with fine teeth ....4. **A. aptera** DC.

Section I. EUAMBROSIA Torr. and Gr. in Flora North Amer. II (1841) 290. —Inflorescence racemose or spicate; pistillate florets usually clustered in lower part of inflorescence. Involucre of pistillate capitula saucer-shaped or campanulate, toothed or truncate along margin.

Subsection 1. **Ecostatae** Smoljan. —Involucre of staminate capitula 519 without ribs, with indistinct radiate veins; receptacle usually with filiform or apically enlarged scales; leaves pinnately divided or bipinnate, divided, alternate, lower opposite.

1. **A. artemisiifolia** L. Sp. pl. (1753) 988; Gray Syn. Fl. of North Amer. I, 2 (1884) 249; Grossh. Fl. Kavk. IV, 112; Sorn. Rast. SSSR, IV, 214; Vizn. Rosl. URSR (1950) 531. —**Ic**.: Hegi, Ill. Fl. VI, 496, fig. 251.

Annual. Stem 20–200 cm high, paniculately branched above, angular, weakly or quite strongly appressed-setose. Upper leaves alternate, sessile, pinnately divided; lower ones opposite, short-petiolate, bipinnately divided, dark green and more or less glabrous beneath, grayish-green above due to dense short bristles. Staminate capitula hemispherical or ovoid, 4–5 mm wide, on 2–3 mm long peduncles, glabrous, drooping. Involucre of entirely connate bracts, somewhat toothed, with occasional small bristles. Receptacle bristly-scaly. Florets obconical, 10–15, glabrous, light yellow, 2 mm long; corolla tube 1 mm wide; anthers ovoid, 1 mm long, filiform; involucre enclosing achene, 4–5 mm long and 2.0–2.5 mm wide, obovoid or ovoid-oblong, on surface sharply and coarsely reticulate, black or brown, with short conical cusp, and four to six short, sharp, spine-like appendages, glabrous or with occasional bristles in lower part. Flowering VIII–X.

Weed in crops, roadsides, irrigation channels and weedy places. —*European Part*: Middle Dnieper, Black Sea Region; *Caucasus*: Ciscaucasia, western and eastern Transcaucasia. *General distribution*: North America, Central America. Described from Mexico. Type in London.

Note. A. artemisiifolia L. is a noxious weed; together with seeds of clover and new commercial crops it was introduced into Europe from

America. In the USSR the common ragweed occurs in the Zaporozhe Region, near Kiev, in the northern Caucasus, in eastern Transcaucasia (Sheki Highland) and on the Black Sea Coast of the Caucasus (vicinity of Sukhumi, Gagri, Pitsunda and other places).

2. **A. psilostachya** DC. Prodr. V (1836) 526.

Perennial. Stem erect, 60–180 cm high, branched, cylindrical, scabrous, gray pubescent from bristles. Leaves numerous, 4–15 cm long, petiolate, upper pinnately, lower bipinnately divided; lobes linear-lanceolate or lanceolate, acuminate or acute, toothed, with numerous appressed grey hairs. Staminate capitula slightly larger than in previous species, on 1 mm long peduncles, florets up to 20, with campanulate 2 mm long corolla; anthers oblong, larger than in previous species, with arcuate cusp
520 at apex, filaments half as long as anthers, flat, glabrous. Involucre covered with fine bristles, denser than in previous species. Receptacle with filiform scales. Involucre enclosing achenes 3–4 mm long, round-ovoid or obovoid, with truncate somewhat obtuse apex, with four short, obtuse tubercles or without, pubescent above. Flowering VII–IX.

Weedy places, introduced. —*European Part*: Baltic. *General distribution*: North and Central America. Described from Mexico. Type in Geneva.

Subsection 2. **Costatae** Smoljan. —Involucre of staminate capitula three- to eight-rowed; receptacle glabrous; leaves opposite, entire or palmate, three- to five-lobed.

3. **A. trifida** L. Sp. pl. (1753) 987; Torr. and Gray Fl. North Amer. II (1841) 290.

Annual. Stem erect, 50 cm high, branched, short, setose-hairy or pilose, sometimes more or less glabrous. Leaves opposite, deeply three- to five-lobed, with ovate-lanceolate, acute or acuminate, serrate lobes, toward base cuneately narrowed, 6–14 mm long, scabrous from fine, bristly hairs, with occasional long glandular hairs above, petiole 2.0–3.5 cm long, dilated at base, narrowly winged, ciliate. Staminate capitula globose, 5 mm wide; involucre saucer-shaped, dorsally three-ribbed, toothed; florets 1–2 mm long, campanulate, light yellow, 25, stamens free, anthers ovoid, acuminate, filaments short, glabrous, ovary abortive. Involucre enclosing achene, 6–12 mm long and 4–5 mm wide, obovoid with short-beaked apex, five- to seven-ribbed, each vein terminating in tubercle, pubescent. Flowering VII–IX.

Weedy places, crops. —*European Part*: Black Sea Region; *Caucasus*: Western Transcaucasia. *General distribution*: North America. Described from America. Type in London.

Note. We have this plant as a weed in the coastal belt of Abkhazia, where it infests geranium plantations and also grows along riverbanks. There are reports of *A. trifida* being found in the Dnepropetrovsk Region.

4. **A. aptera** DC. Prodr. V (1836) 527. —**Exs.**: Berl. Pl. exs. No. 1778; Lindheimer, Fl. Texana exs. 1846; Fasc. III, No. 428.

Annual. Stem erect, 1–4 m high, stiff, branched, particularly above, with sparse setose, pubescence. Leaves opposite, 3.0–7.5 cm long, usually five-, sometimes three-lobed, with ovate-lanceolate, acuminate and serrate-toothed lobes, central segment usually three- to five-lobed, sparsely above, densely short-setose beneath, petiole cylindrical, not dilated at base, densely setose. Involucre of staminate capitula four- to eight-veined, weakly pubescent outside; involucre of pistillate florets connate, of five 521 entire, somewhat obtuse, bracts enclosing achene, 4–6 mm long and 2–3 mm wide, obovate, with long beaked apex, subglabrous, with four to six short ribs terminating into tubercles or tubercles absent. Flowering VII–XI.

Weedy places, in lower zone. —*Caucasus*: Western Transcaucasia. *General distribution*: North and Central America (Mexico). Described from Mexico. Type in Geneva.

Note. An introduced plant, it was collected in 1932 by Yu.N. Voronov at Sukhumi, and in 1924 by S. Dzevanovskii, also from the neighborhood of this city. The species is close to *A. trifida* L. but differs from it by having smaller achenes, petioles not dilated at base, and staminate capitula with a four- to eight-ribbed involucre.

GENUS 1507. **Xanthium** L. [1, 2]

L. Sp. pl. (1753) 987; DC. Prodr. V (1836) 523; Hoffm. in Pflzfam. IV, 5 (1894) 222; Widder in Fedde, Repert. XX (1923) 1

Capitula unisexual, monoecious, sessile, in spicate or racemose inflorescences, axillary or in terminal heads, staminate capitula in upper part of compound inflorescence, more or less globose many-flowered with one-rowed involucre consisting of free bracts; receptacle cylindrical with fine scales enclosing tubular florets. Staminate florets with five-toothed corolla; stamens five, anthers free, apically curved, filaments epipetalous at base of corolla; style not divided. Pistillate capitula solitary or in heads in lower part of compound inflorescence, two-flowered,

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[1] Treatment by L.A. Smoljaninova.

[2] From the Greek word *xanthos*—yellow (from its use as a dye).

with two-rowed involucre; outer involucral bracts free, coriaceous, inner ones connate, with one or two stiff, beak-like, perforate spines at apex, entirely covered with uncinate or straight spines; achenes becoming hard at maturity. Pistillate florets in twos, enclosed in connate involucre, with or without filiform, tubular, inconspicuous corolla; stigma bifid, its lobes filiform, divergent, with papillae exserted from pores in beaked spines at apex of involucre. Achenes oblong, two in each involucre, compressed, without pappus. Annual herbs with alternate, entire, toothed or lobed leaves.

The genus includes up to 70 species growing mainly in North and Central America. Many species are introduced weeds in Europe, Asia Minor, East Asia. About seven species are reported from the USSR.

Economic Importance. The leaves and roots of this plant yield a yellow dye used for dyeing cloth. The seeds of *X. strumarium* L. contain 522 up to 40% oil, which, according to the data of N.M. Maksimov (*Dokl. Akad. Nauk SSSR, Nov. Ser.*, XXVI, No. 4, 1940), is suitable for the preparation of a drying oil.

1. Leaves at base with trifid yellow spines............1. **X. spinosum** L.
+ Leaves at base without spines..2
2. Plants soft pubescent; petioles and veins of leaves usually green; involucre enclosing achenes, with straight, sometimes somewhat falcate, indistinctly uncinate beak at apex.................................3
+ Plants stiff hairy; petioles and veins of leaves usually reddish; involucre enclosing achenes, at apex with differently incurved more or less uncinate beak...4
3. Involucre enclosing achenes broadly ovate or elliptical, tapered to base, 12–14 mm long and 5–7 mm wide, with distinct spines at apex, covered with very fine spinules slightly thickened at base, and 1–2 mm long..................................2. **X. sibiricum** Patrin
+ Involucre enclosing achenes ovate or oblong, tapered to base and apex, 14–17 mm long and 5–6 mm wide, with straight, remote or approximate spines at apex, covered with occasional spinules not reaching apex; spinules at base thickened, 2–3 mm long...3. **X. strumarium** L.
4. Involucre enclosing achenes, oblong upward and tapered to base, 18–22 mm long and 5–6 mm wide, almost glabrous between spines, weakly glandular, with strongly beaked, falcately incurved apex, 3–4 mm long..................................4. **X. occidentale** Bert.
+ Involucre enclosing achenes with more or less dense stiff, glandular pubescence...5.
5. Involucre enclosing achenes oblong or oblong-ovate, dark-brown or brown, 22–28 mm long, covered with uncinate, 4–6 mm long

spines, beaked, beaks falcately incurved from base or middle ....5. **X. californicum** Greene

+ Involucre enclosing achenes elliptical or oblong, yellowish-brown, often reddish, 16–22 mm long, covered with weakly bent, 3 mm long spines, at apex with straight or weakly curved, subulate, divergent, more or less uncinate beaks.. ....6. **X. riparium** Itz. and Hertsch.

Section 1. ACANTHOXANTHIUM DC. Prodr. V (1836) 523; Widder in Fedde, Repert, XX (1923) 19. —Sect. II. *Acanthoplia* (*spinosa*) Wallroth in Beitr. zur. Bot. (1842) 228; 241 (1844). —Petioles with one or two 523 strong, trifid, yellow spines at base; leaves sinuate-pinnate, cuneately narrowed to base; involucre enclosing achenes with one straight spiny beak at apex, a second beak usually absent, entirely covered with numerous uncinate spines.

1. **X. spinosum** L. Sp. pl. (1753) 987; Widder in Fedde, Repert. XX (1923) 122; Som. Rast. SSSR, IV (1935) 217. —**Ic.**: Reichenbach Ic. Fl. Germ. XIX (1860) tab. MDLXXV, fig. 1–14; Widder l. c. —**Exs.**: Fl. exs. Austro-Hungarica No. 3069.

Annual. Stem 20–100 cm high, erect, stiff, cylindrical, finely sulcate, simple or branched, setose, with straight, bifid or trifid, yellow spines at base of leaves. Leaves lanceolate or elliptical-lanceolate, apical leaves undivided, others toothed, sinuate-toothed, or three-lobed, sometimes unequally sinuate-pinnate, with oblong, acuminate central lobe and smaller lateral lobes, with occasional appressed bristles above, densely grayish setose beneath. Involucre enclosing achenes ovate oval, ellipsoid or oblong, 10–13 mm long, 5 mm wide, almost glabrous or with occasional bristles, almost up to apex covered with numerous, slender, uncinate spines, at apex with one slender, straight, spiny, acute-subulate, glabrous, 1 mm long beak, a second beak often lacking. Flowering VII–IX. (Plate XXXII, Fig. 2).

Dumps, roadsides, pastures. *European Part*: Bessarabia, Middle Dnieper, Black Sea Region, Lower Don, Crimea; *Caucasus*: All regions; *Western Siberia*: Upper Tobol; *Far East*: Ussuri; *Soviet Central Asia*: All regions. *General distribution*: South and North America, Antilles Islands, Atlantic Europe, central Europe and western and eastern Mediterranean, Balkans-Asia Minor, Armenia and Kurdistan, Iran. Described from America. Type in London.

Note. The species *X. medium* Nosat. described by Nosatovskii (*Izv. Peterb. Bot. Sada*, 1914, 451), differs from *X. spinosum* by sparse, simple spines. Apparently this plant is an anomalous form of *X. spinosum.*

Section 2. EUXANTHIUM DC. Prodr. V (1836) 523; Widder in Fedde, Repert. XX (1923) 18. —Sect. 1. *Anoplia* (*inermia*) Wallroth in Beitr. z. Bot. 1, 2 (1842) 227. —Spines on stem at base of leaves absent; leaves cordate, basally cuneate or rhombic-oblong, three-lobed, sometimes unlobed and toothed, serrate, or crenate; involucre enclosing achenes with two more or less uncinate beaks at apex, less often straight, covered with uncinate spines.

Subsection 1. **Orthorrhyncha** Wallroth in Beitr. z. Bot. 1/2 (1842) 227; emend. Widder ibid. —Sect. 1. *Anoplia* (*inermia*) Trib. *A. orthorrhyncha* 524 Wallroth ibid. —Plants with soft pubescent leaves; fruits small; involucre enclosing achenes greenish, grayish-green or yellowish, sometimes slightly reddish, soft pubescent, with usually straight, less often slightly falcate, apically straight or indistinctly uncinate, beaks.

2. **X. sibiricum** Patrin in Sched. apud Widder in Fedde, Repert. XX (1923) 32. —*X. strumarium* L. Sp. pl. (1753) 987, p. p.; Maxim. Prim. Fl. Amur. 152, p. p. —**Ic.**: Widder op. cit. taf. I, fig. 6, 7, 8. —**Exs.**: Cavaleri, Pl. de Chine, No. 3814.

Annual. Stem 40–60 cm high, straight, stiff, simple or branched, terete below, sulcate above. Leaves deltoid-ovate or cordate, 5–9 cm long and 5–10 cm wide, indistinctly, unevenly serrate-toothed, sometimes almost entire, on both sides finely appressed-hairy or setose; petiole 3–11 cm long. Involucre enclosing achene oval or ellipsoid narrowed to base or bulging, 12–15 mm long, 4–7 mm wide, moderately glandular-pubescent, uniformly covered with short (1–2 mm long) spines, slender, straight, at base slightly thickened, uncinate at apex, glandular-pubescent from base to middle or glabrous, yellowish or greenish; beaks at apex of involucre usually straight, sometimes falcate, conical-acute, often unequal, remote, parallel, less often convergent, pubescent, 1.5–2.5 mm long. Flowering VII–IX.

Riverbanks and valleys, weedy places. —*Caucasus*: Southern and eastern Transcaucasia; *Western Siberia*: Upper Tobol, Ob Region; *Eastern Siberia*: Dauria; *Far East*: Ussuri, Sakhalin; *Central Asia*: All regions. *General distribution*: Northern Iran, India and Himalayas (Kashmir), China, Japan. Described from Siberia. Type in Geneva.

Note. The differences of the Siberian form of *X. strumarium* L. from the central European form of this species were noted in 1782 by Patrain, who referred it to *X. strumarium* var. *sibiricum* or to the separate species *X. sibiricum*. The differences between plants from the Amur Region and *X. strumarium* L. were also established by Maksimovich (1850); but *X. sibiricum* was described first by Widder.

3. **X. strumarium** L. Sp. pl. (1753) 987; Wallroth in Beitr. z. Bot. I (1842) 234; Ldb. Fl. Ross. II, 514; Widder in Fedde, Repert. XX (1923) 38; Sorn. Rast. SSSR, IV, 216. —**Ic.**: Rchb. Ic. Fl. Germ. XIX (1860) tab. DDLXXVI. —**Exs.**: Sennen, Plantes d'Espagne, No. 1409.

Annual. Stem 15–20 cm high, grayish-green, erect, stiff, branched, 525 sometimes simple, pubescent, glandular above. Leaves petiolate, cordate, three- to five-lobed, unequally coarsely toothed, on both sides with fine appressed hairs or setose. Involucre enclosing achenes ellipsoidal or oval, saccate, green or grayish-green, often reddish, less often almost brownish, 10–15 mm long and 5–9 mm wide, tapered to base and apex, finely pubescent with appressed hairs, unevenly covered with occasional spines not extending to apex, 2–3 mm long, slender, thickened at base, straight, at apex uncinate, weakly puberulent; beaks usually straight, sometimes falcate, conical-acute, almost equal, inclined or convergent. Flowering VII–IX. (Plate XXXII, Fig. 1).

Introduced weed, widely distributed particularly in the southern regions; found near dwellings, roadsides, on vacant lands, along banks of rivers and irrigation channels, in fields of cotton and other crops; vegetable gardens. —*European Part*: All regions (except Karelia-Lapland, Dvina-Pechora, and Ladoga-Ilmen), Crimea; *Caucasus*: All regions; *Western Siberia*: Upper Tobol; *Soviet Central Asia*: All regions. *General distribution*: North America, Scandinavia, central Europe, Atlantic Europe, western and eastern Mediterranean, Balkans-Asia Minor, Armenia and Kurdistan, Iran. Described from western Europe. Type in London.

Series 1. Glabrata Widder in Fedde, Repert. XX (1923) 18; Widder, ibid. 21 (1925) 281. —Involucre enclosing achenes, its beaks and spines glabrous or subglabrous, weakly setose and glandular pubescent.

4. **X. occidentale** Bertol Lucubr. II (1822) 36; Widder in Fedde, Repert. XX (1923) 60; Fl. Gruzii, VIII (1952) 296; **Ic.**: Widder op. cit. taf. I, 16, 17. —**Exs.**: Eggers, Fl. exs. Ind. occid. No. 797, 199, 133.

Annual. Stem erect, 25–150 cm high, cylindrical or bluntly angular, branched. Leaves large, 7–10 cm long and 8–9 cm wide, at base cordate, three- to five-lobed, coarsely and unequally toothed, with strongly setose and sparse glandular hairs, on 5–11 cm long petioles. Involucre enclosing achenes oblong, saccate, tapered to base and apex, 18–23 mm long and 526 5–8 mm wide, brownish or dark brown, almost glabrous, with occasional stiff, glandular hairs, moderately covered with 2.0–4.5 mm long spines, straight, strong, at apex always uncinate, glabrous, very rarely at base with glandular pubescence, beaks 3–4 mm long, very stiff, thickened at base, divergent, tapering almost from base to apex, more or less falcate,

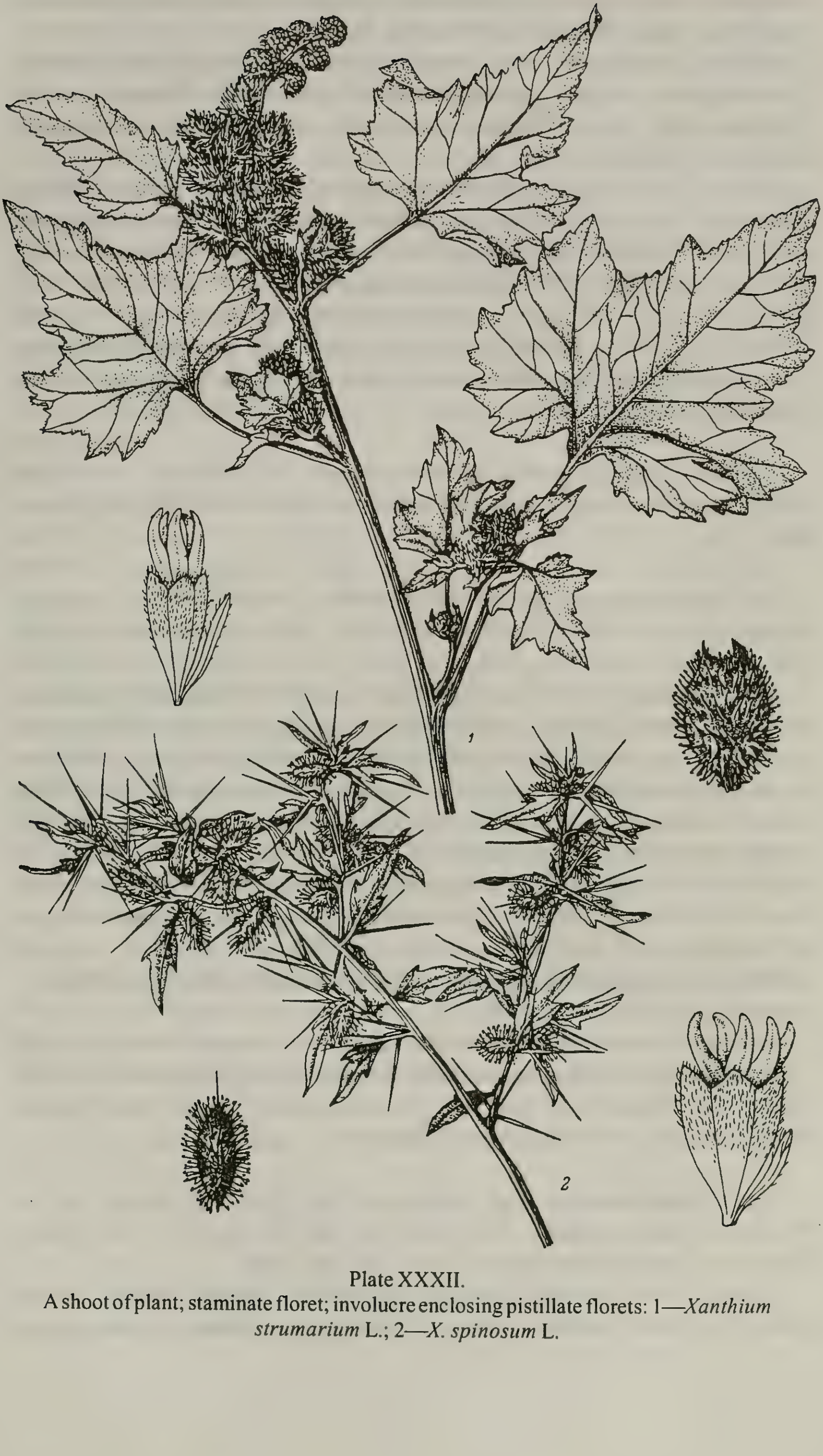

Plate XXXII.
A shoot of plant; staminate floret; involucre enclosing pistillate florets: 1—*Xanthium strumarium* L.; 2—*X. spinosum* L.

inclined to each other, at apex always shortly uncinate, glabrous or with occasional short stiff hairs. Flowering V–VIII.

Weed, introduced from America. *Caucasus:* Eastern and western Transcaucasia. *General distribution:* Bermuda Islands, Bahama Islands, the Great and Lesser Antilles Islands and coastal areas of Venezuela. Described from Italy.

Note. This species is found in Abkhazia (Ozurgeti District), Kutaisi District, as well as in the Kura River valley (between Evlakh and Salyany) and in the southwestern part of the Shirvan steppe. Specimens of *X. occidentale* found in the Caucasus were mistakenly referred by A.A. Grossheim to *X. orientale* L., which has not been found so far in the USSR. *X. occidentale* Bertol. is close to *X. pungens* Wallroth, from which it is distinguished by lobed leaves, darker-colored fruits, and denser involucral spines.

Series 2. Hispida Widder in Fedde, Repert. XX (1923) 19. —Involucre enclosing achenes, its spines and beaks more or less hispid and glandular.

5. **X. californicum** Greene in Pittonia IV (1899) 62; Widder in Fedde, Repert. XX (1923) 110 and 86. —**Ic.**: Widder op. cit. taf. III, fig. 37–38.

Annual. Stem 50–225 cm high, erect, simple or branched, cylindrical or sulcate, strongly hispid, reddish. Leaves deltoid, 5–11 cm long and 6–11 cm wide, three- to five-lobed, cordate, short-acuminate, bidentate or irregularly serrate-toothed, hirsute, petioles 4–14 cm long and 2–3 mm wide. Involucre enclosing achenes not equilateral, oblong or oblong-ovate, brownish or dark brown, 22–28 mm long and 7–8 mm wide, moderately covered with 4–6 mm long, straight, apically uncinate, from base to middle and above densely hirsute and glandular; beaks at apex of involucre stiff, straight to middle and divergent, falcately incurved above, at apex uncinate, as long as spines, densely glandular-pubescent. Flowering VII–X.

529 Weed of roadsides, sandy riverbanks. —*European Part:* Crimea, Lower Don (Rostov Region), Middle Dnieper (Kiev, Kamenets-Podolsk); *Caucasus:* Western and southern Transcaucasia. *General distribution:* Western states of North America. Described from America.

6. **X. riparium** Itz. and Hertsch. in Bot. Zeit. XII (1854) 34–35; Widder in Fedde, Repert. XX (1923) 19 and 101, fig. 33, 34. —**Exs.**: GRF No. 1166; Woloszczak, Fl. pol. exs. No. 654.

Stem 15–120 cm high, sulcate, light-yellow, sparsely setose. Leaves deltoid or ovate, weakly three- to five-lobed, at base cuneate, short-acuminate, 9–18 cm long, 7–13 cm wide, unequally and coarsely serrate-dentate, scabrous on both sides from setaceous hairs, with short, golden-yellow, glandular hairs; petioles 5–15 cm long and 5 mm wide, with occasional setose hairs. Involucre enclosing achenes elliptical or oblong, symmetrical or not, brown, yellowish-brown or often reddish, 16–22 mm long and 5–9 mm wide, densely setose with short, yellow, glandular hairs, entirely covered with frequent spines; spines 2–3 mm long, golden-yellow, slender, slightly curved, apically narrower, subulate, sometimes more or less uncinate, densely setose and glandular hairy from base to middle, beaks at apex of involucre 5 mm long, stiff, straight, divergent, acute, apically straight or more or less uncinate, almost to apex glandular hairy and setose. Flowering VII–IX.

Riverbanks, damp, sandy and weedy places. —*European Part*: Baltic Region. *General distribution*: Central Europe. Described from Western Europe.

Tribe 5. **HELIANTHEAE** Cass. in Bull. Soc. Philom. Paris (1815) 173 and Dict. Sc. Nat. X (1818) 419, XX (1821) 346, XXXVIII (1825) 16, LX (1830) 574; Less. Synops. Comp. (1832) 221; DC. Prodr. V (1836) 534; O. Hoffm. in Pflanzenfam. IV, 5 (1889–1894) 210.—Tribe Helianthoideae Benth. in Benth. and Hook. f. Gen. Pl. II (1873) 189. Capitula heterogamous or homogamous, usually with peripheral ligulate florets; receptacle squamose, only sometimes scales absent in sterile disk florets; anthers at base usually obtuse or round; style branches truncate at apex, sometimes with a short appendage, in sterile florets style usually undivided. Corollas usually yellow, less often (particularly corollas of peripheral florets) of different color. Leaves usually opposite, sometimes alternate.

Herbs or semishrubs, less often shrubs and arborescent forms (tropics), the considerable majority occurring in America.

See page 478 for key to the genera of Heliantheae.

530 Subtribe 1. **MELAMPODINAE** O. Hoffm. in Pflanzenfam. IV, 5 (1889–1894) 214. —Capitula heterogamous; peripheral florets pistillate, fertile; disk florets sterile, with usually undivided style. Receptacle squamose; pappus absent or of two or few aristate scales, or short coronate.

GENUS *__Parthenium__ L.[1,2]

L. Sp. pl. (1753) 288; Torrey and Gray, Fl. North Amer. II (1841) 284; Gray, Syn. Fl. North Amer. I, 2 (1884) 62; Hoffm. in Pflanzenfam. IV, 5 (1894) 219

Capitula small, many-flowered, heterogamous, in corymbose-semiumbellate or paniculate inflorescences, sometimes solitary. Involucre broadly campanulate or hemispherical, two- or three-rowed. Receptacle convex, conical or cylindrical, with small scales. Florets small, white or yellow; ray florets pistillate, one-whorled, five, fertile, one each in axils of inner involucral bracts, ligule very short, bilobed, persisting for some time with mature achene; stigma with obtuse hemispherical lobes; at base of inner involucral bracts, on both sides of pistillate floret, with two bisexual florets, each enclosed in tubular plicate scales of receptacle. Central florets bisexual, numerous, tubular, sterile; each floret with receptacular scale adjoining it; stigma undivided; stamens epipetalous at base of corolla; anthers slightly syngenesious, at base entire. Achenes ovoid or obovoid, slightly compressed, keeled, with filiform callous edge. Achenes basally fused with adjacent involucral bracts, but its thick angles facing lateral ribs joined with strands to two tubular scales enclosing bisexual florets; longitudinally fused along median line of these scales; later base of achene detached from involucral bracts, but its edges remain connected with two strands to receptacular scales. Pappus of two or three short, aristate scales at apex of ovary, sometimes entirely absent. Leaves alternate, pinnate, pinnatifid or undivided. Perennial herbs or semishrubs, sometimes annuals, grayish setose.

The genus includes 24 species in North and Central America and the West Indies; of these, 2 are indigenous to South America.

1. **P. argentatum** Gray. Syn. Fl. North. Amer. I, 2 (1884) 245.

531 Perennial. Semishrub, 30–70 cm high, with brownish-gray bark, branched, young shoots silver-gray or grayish-greenish with short, appressed, dense tomentum. Leaves 5–8 cm long and 0.8–1.5 cm wide, lanceolate, or spatulate, sinuate with two pairs of teeth or pinnately divided with three to five pairs of acute, lateral lobes, tapering to base grayish-green or silvery, with occasional hairs above, densely grayish setose beneath. Capitula about 6 mm wide, 10–20, terminal, on long pubescent peduncles on upper branches. Involucre broadly campanulate; outer bracts five, green, ovate, 2 mm long, inner ones almost rotund, weakly three-lobed, concave, 3.0–3.5 mm long and 3.5–4.0 mm wide,

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[1] Treatment by L.A. Smoljaninova.

[2] From the Greek word *parthenos*—young woman (named so for the medicinal use of the plant during menstrual cycles).

scaly, in middle greenish, along margin white-pellucid, unequally toothed, glandular hairy. Pistillate florets yellow, with bilobed, ligulate, glabrous corolla, 2 mm long and 1 mm wide; style 1 mm long; stigma bifid, glabrous, stigma lobes 0.5 mm long; ovary obovoid, four-ribbed, 2.5 mm long and 1.5 mm wide, grayish glandular-pubescent, with three small scales at apex. Bisexual florets 18–32, obconical, with five-toothed corolla 2.3–2.5 mm long and 1 mm wide; anthers oval-oblong, slightly acuminate, 1 mm long, syngenesious in a tube surrounding style, basally short-acuminate, filaments flat, 0.5–1.0 mm long, glabrous, free; style 1.5 mm long; stigma simple, almost capitate, obtusely radiate-fimbriate; ovary abortive. Receptacular scales adjacent to bisexual florets 2.5 mm long and 1.5 mm wide, obovate, concave, scarious, glabrous inside, papillose outside, toothed, teeth terminating in long papillae. Achenes 2.5 mm long and 1.5–1.8 mm wide, ovoid, somewhat tapered to base, four-ribbed, with short, gray, appressed-pubescent along ribs and apex, almost black, with persistent ligulate corona at apex and also two brown, small (1 mm long and 0.3 mm wide), lanceolate, toothed, yellowish, pubescent scales laterally, third scale much smaller, shorter, ventral. Flowering VI–VIII.

It is being tested experimentally as a rubber plant in subtropical regions of the USSR, in southern Transcaucasia, Nagornyi Karabakh and Soviet Cental Asia. The place of origin of guayule is North and Central America (Texas, northern Mexico). In Mexico this species grows in the deserts of the northern part of the Mexican highland at 600 to 3,000 m with the average annual precipitation ranging from 200 to 500 mm. Described from Mexico. Type in North America.

Economic Importance. The possibility of cultivating rubber-bearing plants in regions of the USSR arose already in 1924, when Resinotrust* attempted to introduce them to the Black Sea Coast of the Caucasus in the Adzharian ASSR (Batumi Region, Tsikhis-Dziri). Research was initi-
532 ated in 1927 on acclimatization of rubber-bearing plants by the Sukhumi Division of the All-Union Institute of Applied Botany (now All-Union Institute of Plant Industry). Special attention was paid to guayule, *Parthenium argentatum* Gray, the seeds of which were bought back by the Resinotrust expedition from northern Mexico (collections of G.G. Bosse and S.V. Juzepczuk) and also were received from the US Department of Agriculture. Cultivation experiments with this plant were also conducted in the Apsheron Peninsula in Mardakyani near Baku, in the wormwood semidesert in the Bardi, Evlakh and Kirovabad districts, in the southern part of Turkmenia (in Karakala City), and near Tashkent (in Tarnau) on the experimental farms of the All-Union Institute of Plant Industry.

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*State Trust of the Rubber Industry—Translator.

Guayule is a valuable rubber-bearing plant with an abundance of latex containing rubber. Selected American varieties yield up to 15–18% and in specific cases up to 25% rubber by dry weight of plant biomass. Frost-resistant varieties with rubber content up to 12–15% and higher have been developed in the USSR. The most suitable zone for the cultivation of guayule has proved to be the arid subtropical regions of Transcaucasia.

Subtribe 2. **ZINNINAE** O. Hoffm. in Pflanzenfam. IV, 5 (1889–1894) 224. —Capitula heterogamous; peripheral florets pistillate, fertile; disk florets bisexual, usually also fertile. Receptacle squamose. Pappus absent or aristate.

GENUS ***Zinnia** L.[1,2]

L. Syst. pl. ed. 10 (1759) 1221, nom. conserv. —*Crassina* Scepin, Sched. acid veget. (1758) 42

Capitula medium or relatively large, on long, usually upward-thickened peduncles. Involucre campanulate, many-rowed, bracts imbricate. Peripheral florets, one-whorled, pistillate, variously colored, appressed with rotund or sinuate limb; disk (inner ones in the capitulum) florets tubular, bisexual, five-toothed, sparsely fine-glandular-hairy, ligulate florets more densely glandular-pubescent; receptacle conical, cylindrical at fruiting, covered with scales folded along bracts enclosing disk florets and achenes; achenes more or less three-angled or flat; pappus of one to three teeth or unequal awns, or absent. Annual or perennial herbs or semishrubs with sessile, opposite (or whorled), entire leaves.

1. **Z. elegans** Jacq. Coll. bot. III (1789) 152; DC. Prodr. V, 536; Hoffm. in Pflanzenfam. IV, 5, 225; Schmalh. Fl. II, 55; Hegi, Ill. Fl. IV, 533 1, 527; Bailey L.H. Stand. Cyclop. Horticult. (1922) 3545; Vizn. Rosl. URSR (1950) 533; Chittenden O. B. E. Dict. of Gard. (1952) 2311; Pidotii, Opredel. Semyan Dekorat. Rast. (1952) 101. —**Ic.**: Bailey op. cit. fig. 4048–4050; Hoffm. op. cit., fig. 114, A–D; Pidotii, op. cit., Plate XXXI, 1-2.

Annual. Stem 20–75(100) cm high, erect, branched, pubescent. Leaves opposite, oblong-ovate to broadly lanceolate (upper ones) or ovate, sca-

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[1] Treatment by I.T. Vassilczenko.

[2] Named after I.G. Zinn (1727–1759), Professor of Botany in Göttingen. The generic name having priority is *Crassina*, proposed by the Russian researcher, Shchepin, in honor of S.P. Krasheninnikov. However, *Zinnia* has been included in the list of conserved generic names.

brous, sessile, at base more or less cordate, amplexicaul, with three to seven longitudinal veins. Capitula terminal; involucral bracts ovate or broadly oval, at apex broadly rounded and with blackish border, pubescent. Ligulate florets variously colored (purple, pink, lilac, etc.); tubular (disk) florets yellow or orange; bracts basally ovate, elongate above, carinate, along ridge and often along margin pubescent, at apex fimbriate. Achenes more or less compressed, three-angled, or (inner) flat, cuneate to broadly ovoid, along margin often with narrow border, finely scabrous to tuberculate, along margin and sometimes entirely covered with short, appressed hairs or glabrous, dark gray, brownish or brown, 5–12(14) mm long, 2–6 mm wide. Flowering VI–X.

It is cultivated in its usual and double forms and is one of the most widely distributed and popular ornamental plants (flowers). *General distribution*: Originates from Mexico; cultivated in all parts of the world. Described from Mexico. Type in Vienna.

Note. Besides this species, we also grow the following less widely distributed species: 1) *Z. haageana* Rgl. [in *Vestn. Ross. Obshch. Sadov.* (1863) 50] —with much more narrowly lanceolate leaves than *Z. elegans*, which are not amplexicaul, and orange flowers (ligulate and disk); 2) *Z. multiflora* L. —achenes long and narrow, narrowly cuneate, 9–10(12) mm long, 2.2–3.0 mm wide, acuminate toward base, longitudinally ribbed; ligulate florets usually red or purple; disk florets yellow, and 3) *Z. pauciflora* L. with capitula up to 2.5 cm wide usually with yellow flowers.

Many varieties (and cultivars) are distinguished within *Z. elegans* Jacq., of which we shall mention the following: a) var. *violacea* DC. —with tips of bracts and ligulate florets purple violet *Z. violacea* Cav.); b) var. *alba* DC. —with tips of bracts and ligulate florets white; c) var. *coccinea* DC. —with tips of bracts and ligulate florets blood red.

The species of zinnia cross with each other. Bailey (1922) assigned all zinnia species to three groups: 1) Tall zinnias with stems up to 50–100 cm high (e.g. *Z. elegans*); 2) medium-size zinnias (30–50 cm high); and 3) dwarf zinnias (8–30 cm high). However, this classification is quite artificial.

534 GENUS **Sanvitalia* Gualt.[1, 2]

Gualt. in Lam. Journ. Hist. Nat. 2 (1792) 176

Capitula many-flowered, solitary; involucre two- or three-rowed with appressed, almost imbricate, bracts, outer herbaceous, considerably longer

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[1] Treatment by I.T. Vassilczenko.

[2] Named in honor of the distinguished Italian family Sanvitali.

than innner; ligulate florets yellow, orange or white, pistillate, three-toothed at apex; inner (disk) florets tubular, bisexual, blackish violet, five-toothed. Receptacle convex with carinate oblong bracts, enclosing achenes up to middle. Achenes three-angled-prismatic, more or less flat or almost so; outer achenes glabrous with three awns in upper part; inner achenes winged, usually ciliolate. Annual herbs with opposite and ovate (or oblong-ovate) leaves, usually pilose.

1. **S. procumbens** Lam. Journ. Hist. Nat. 2 (1792) 176; DC. Prodr. V, 628; Hoffm. in Pflanzenfam. IV, 5 (1894), 226; Hegi, Ill. Fl. VI, 1, 528; Pidotii, Opredel. Semyan Dekorat. Rast. (1952) 98. —*S. villosa* Cav. Ic. and descr. pl. IV (1797) 31. —**Ic.**: Lam. op. cit. tab. 33; Hoffm. op. cit. fig. 71, i, k; Pidotti, op. cit. Plate XXV, 1–2.

Annual. Stem branched, procumbent or ascending, 20–50 cm high, more or less pilose. Leaves rhombic-ovate or oblong-ovate, entire, less often toothed, on both sides sparsely pubescent with appressed hairs, petiolate, petioles one-fifth to one-fourth as long as lamina. Capitula terminal, solitary, about 1 cm wide. Involucral bracts pubescent; inner bracts cartilaginous in lower part, at apex herbaceous. Ligulate florets orange-yellow, 10–12, three-toothed; inner (disk) florets dark-violet, at apex five-toothed; bracts scaly, oblong-lanceolate, straw-yellow. Outer achenes light yellowish-gray, flat, three-angled, at apex with three awns, resembling achenes of *Bidens*; inner achenes compressed, three-angled to flat, dark-gray or dark-brown, at apex with or without two spinescent teeth, narrowly winged along border, covered with rows of white tubercles, sometimes without, and then finely longitudinally ribbed; often short-pubescent along borders, usually 2.5–3.5 mm long and 1.5–2.0 mm wide. Flowering VI–VIII.

Cultivated as an ornamental. *General distribution*: Central America; cultivated in other countries of the world as well. Described from Mexico. Type in Paris.

535 *GENUS **Heliopsis** Pers.[1, 2]

Pers. Syn. 2 (1807) 473

Capitula relatively large, on long, often upward thickened peduncles; involucre hemispherical or broadly campanulate, two- or three-rowed; ligulate florets yellow, pistillate, inner (tubular) florets yellow, bisexual. Receptacle convex to conical, bracts enclosing inner (tubular) florets.

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[1] Treatment by I.T. Vassilczenko.

[2] From the Greek words *helios*—the sun, and *opsis*—similar; so named on the basis of the shape of blooming capitula.

Achenes cuneate, obtusely three- or four-angled or cylindrical, at apex truncate; pappus absent or in form of a small corona along upper edge of achene. Annual or perennial herbs with opposite, ovate or oblong-ovate, serrate-toothed leaves with three "main" veins diverging from base of lamina.

1. **H. scabra** Dun. in Mém. Mus. Paris 5 (1819) 56; DC. Prodr. V, 585; Britton and Brown, Ill. Fl. North. Unit. States, III (1913) 467; Hegi Ill. Fl. VI, 1, 528; Kotov in Bot. Zhurn. Akad. Nauk URSR, VI, 1 (1949) 75. —*H. helianthoides* var. *scabra* (Dun.) Fernald. Gray's Manual of Bot. (1950) 1479. —**Ic.**: Britton and Brown op. cit. p. 467; Dunal op. cit. pl. 8 (p. 52).

Perennial. Stem erect, branched above or simple, scabrous, up to 50–75(100) cm high. Leaves ovate or oblong-ovate, acuminate, coarsely serrate-toothed, at base short-cuneate or rounded to weakly cordate, short-petiolate, green above, pale- and bluish-green beneath, on both sides and along margin scabrous from short stiff hairs (3)5–12(15) cm long, (1.5)2.5–5.0(7.0) cm wide, with three "main" (i.e., of equal thickness) veins from base. Capitula terminal, quite large, 2–3 cm wide, sometimes larger. Involucral bracts oblong, finely and densely pubescent, cartilaginous in lower part with thick, prominent veins, in upper part green, with thin veins; bracts linear, glabrous, straw-yellow, more or less curved all along (boat-shaped). Ray florets oblong-linear, 2.0–2.5 cm long; achenes obtusely tetrahedral, dark brown, 3.5–4.5 mm long, 1.0–1.5 mm wide, pubescent along ribs when young, later glabrous with sparse whitish barbs, with few inconspicuous teeth at apex (traces of pappus). Flowering VII–VIII.

Weed in gardens, groves, around hedges and buildings. —*European Part*: Middle Dnieper (known from the area of the city of Belaya Tserkov and several other localities in the Ukrainian SSR, the plant is in a colonizing phase). *General distribution*: America (North and Central); it is cultivated in Europe and other countries as an ornamental, sometimes naturalized. Described from plants grown in Montpelier from seeds obtained from North America. Type in Montpelier.

536 *Note*. This plant was grown earlier in the Botanical Garden in Leningrad, where it flowered and produced seeds.

Subtribe 3. **VERBESININAE** O. Hoffm. in Pflanzenfam. IV, 5 (1889–1894) 226. —Capitula heterogamous or homogamous. Peripheral florets pistillate, fertile or sterile because of reduction (asexual); disk florets bisexual, fertile or innermost florets sometimes sterile. Receptacle squamose, scales often longitudinally folded. Pappus absent or reduced (as short teeth), sometimes awned or of small deciduous scales.

GENUS 1508. **Siegesbeckia** L.[1,2]

L. Sp. pl. (1753) 900

Capitula many-flowered, pedunculate, usually in small corymbs, terminal and axillary. Involucre two-rowed, campanulate; its outer bracts five, linear-spatulate, erect, densely glandular hairy, exceeding inner; inner bracts straight, dorsally glandular, enclosing achenes up to middle. Florets yellow; peripheral florets one-whorled, short-ligulate, pistillate, inner florets tubular, bisexual. Receptacle flat, with scaly pales covering achenes. Achenes oblong obovate, tetrahedral, without pappus; outer achenes more or less curved. Herbs with opposite, petiolate, densely pubescent leaves.

1. **S. orientalis** L. Sp. pl. (1753) 900; M.B. Fl. taur.-cauc. II, 339; DC. Prodr. V, 495; Ldb. Fl. Ross. II, 2, 512; Boiss. Fl. or. III, 250; Hoffm. in Pflanzenfam. IV, 5, 231; Schmalh. Fl. II, 56; Grossh. Fl. Kavk. IV, 112; Krashenin., Iljin and Vassilcz. in Sorn. Rast. SSSR, IV (1925) 218. —*S. iberica* Willd. Sp. pl. III (1798) 2220; —*S. caspica* Fisch. and Mey. in Hoh. Enum. pl. Talysch. (1838) 54. —**Ic.**: Hoffm. op. cit. fig. 710. —**Exs.**: GRF No. 369.

Annual. Stem erect, simple or dichotomously branched, branches opposite, obtusely angular, 30–75(100) cm high, more or less crisped hairy to densely tomentose, particularly above. Leaves ovate-triangular, ovate, or oblong-ovate, at base cuneate or rounded to slightly cordate, coarsely, generally unevenly dentate (to sinuate-toothed), sometimes resembling reduced leaves of sunflower, pubescent with appressed hairs (particularly beneath), acute or acuminate, sometimes with sparse fine glands or hairs. Capitula small (about 5 mm wide). Outer involucral 537 bracts covered with dense, capitate, stalked hairs, oblong-obovate or linear spatulate, distinctly exceeding inner bracts, sometimes broader and with few glands [var. *caspica* (Fisch. and Mey.) Grossh.] or shorter; inner bracts shorter than outer. Achenes obpyramidal, dark gray or dull black, sometimes covered with sparse, light-colored, smooth, irregular tubercles, about 3 mm long, 1.2 mm wide, at apex with white, annular tuft; outer achenes slightly curved. Flowering VI–VIII. (Plate XXXIV, Fig. 2).

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[1] Treatment by I.T. Vassilczenko.

[2] Named after J.G. Siegesbeck, Director of Garden of Medicinal Plants in Peterburg (1735–1747).

Gardens, vegetable gardens, near hedges and buildings, roadsides, sometimes in fields. A weed. *European Part*: Black Sea Region, Crimea; *Caucasus*: All regions. *Far East*: Zeya-Bureya, Ussuri; *Soviet Central Asia*: Balkhash Region, Syr-Darya, Pamiro-Alai. *General distribution*: Subtropics and tropics of the Orient, North America. Described from China and Middle East. Type in London.

Note. This plant is in a period of naturalizing and is advancing to new regions. In the work of Schmalhausen (op. cit.) there is a mention of an occurrence of this plant in the western Ukraine ("Podol."), which, however, has not been confirmed by later investigations. Plants with broad outer involucral bracts (*S. caspica* Fisch. and Mey.) were treated by Boissier. (op. cit.) as variety *subeglandulosa* Boiss., and later Grossheim named this plant *S. orientalis* var. *caspica* (Fisch. and Mey.) Grossh.

GENUS 1509. **Eclipta** L.[1,2]

L. Mantissa, II (1771) 157

Capitula many-flowered, clustered, terminal and axillary, on short peduncles; involucre two-rowed, of herbaceous bracts. Flowers white; peripheral florets with short and narrow ligule, pistillate; central florets tubular, bisexual, four-toothed. Receptacle plano-convex, covered with scaly bracts. Style branches in pistillate florets short-filiform, somewhat swollen in bisexual florets. Achenes without or with pappus reduced to small teeth, cuneate, 3-angled, tuberculate or fringed, inner achenes more or less compressed. Annual plants with opposite leaves.

1. Achenes smooth, fringed.................................1. **E. prostrata** L.
+ Achenes tuberculate along ribs or over whole surface.......... ....2. **E. alba** (L.) Hasskarl.

1. **E. prostrata** L. Mant. II (1771) 286; DC. Prodr. V, 490; Ldb. Fl. 538 Ross. II, 2, 512. —*E. marginata* Steud. Nom. Bot. I (1840) 542; Boiss. Fl. or. III, 250; Grossh. Fl. Kavk. IV, 113; Sorn. Rast. SSSR, IV, 241. —*Verbesina prostrata* L. Sp. pl. (1753) 902.

Annual. Stem 10–50 cm high, usually branched from base, ascending or prostrate, with fine appressed hairs, more densely above. Leaves oblong-lanceolate or oblong, sessile, serrate-toothed, teeth directed upward, sometimes only sinuate, covered with numerous fine appressed hairs. Capitula 6–8 mm wide; involucre of oblong, long, outer bracts and shorter, oblong-lanceolate, inner bracts; involucral bracts covered with

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[1] Treeatment by I.T. Vassilczenko.

[2] From the Greek word *ecleipo*—absent (achenes without pappus).

fine appressed hairs, with thick, light-colored (yellowish), longitudinal veins. Ligulate florets short, half as long as involucre; bracts setose, ventrally pubescent. Achenes prismatic, somewhat swollen above, 2–3 mm long, 1.0–1.5 mm wide, smooth, without tubercles or sometimes with few inconspicuous tubercles along fine ventral rib, dark grayish-brown, along edges fringed, light yellowish-brown. Flowering VI. (Plate XXXIV, Fig. 3).

Weed in rice fields and other wet places. —*Caucasus*: Eastern Transcaucasia, Talysh. *General distribution*: Iran, South Asia. Described from India. Type in London.

2. **E. alba** (L.) Hasskarl. Pl. Jav. Rar. (1848) 27; Boiss. Fl. or. III, 249; Hoffm. in Pflanzenfam. IV, 5, 231; Grossh. Fl. Kavk. IV, 113; Sorn. Rast. SSSR, IV, 241; Fernald, Gray's Manual of Botany (1950) 1479. — *E. erecta*. L. Mant. II (1771) 157; DC. Prodr. V (1836) 890; Ldb. Fl. Ross. II, 2 (1845–1846) 512. —*Verbesina alba* L. Sp. pl. (1753) 902; Britton and Brown, Ill. Fl. North Unit. Stat. III (1913) 470. —**Ic.**: Britton and Brown ibid., p. 468.

Annual. Stems 8–10 to 60 cm high, erect, ascending, sometimes prostrate, branched, covered with somewhat stiff, fine, appressed hairs. Leaves oblong-lanceolate or oblong-ovate to oblong, on short petioles, remotely serrate-toothed or more or less sinuate. Capitula about 7–8 mm wide, one or two in leaf axils, on short peduncles. Involucral bracts oblong-ovate or ovate, appressed hairy, and with prominent longitudinal veins. Receptacle squamose, scales linear or narrowly linear, pubescent above. Ligulate florets somewhat shorter than involucre. Achenes prismatic, more or less laterally compressed, slightly swollen above, 2.0–2.5 mm long, 1.0–1.25 mm wide, along ribs, but often entirely, finely sinuately tuberculate. Flowering VI. (Plate XXXIV, Fig. 4).

Distributed as former species, but considerably rarer. *Caucasus*: Eastern Trancaucasia, Talysh. *General distribution*: Tropics and subtropics throughout the world. Described from the state of Virginia (USA) and Surinam. Type in London.

539

GENUS *Rudbeckia L.[1,2]

L. Sp. pl. (1753) 906

Capitula large (up to 10–12 cm wide), many-flowered, on long peduncles; involucre broadly hemispherical to saucer-shaped, two

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[1] Treatment by I.T. Vassilczenko.

[2] Named in honor of O. Rudbeck, Professor of Botany and Anatomy in the University of Uppsala (1660–1740).

(sometimes four)-rowed, bracts herbaceous, squarrose. Receptacle strongly convex to conical, later cylindrical, by fruiting time often more elongated, covered with acute, membranous, flat or boat-shaped bracts. Ligulate florets sterile, bright-colored (yellow, orange, red); inner [disk] florets tubular, bisexual, brown or purple. Achenes tetrahedral, obpyramidal, sometimes cylindrical, more or less compressed; pappus absent or in form of small, toothed corona. Annual or perennial herbs with tall, usually branched stem and alternate or opposite leaves.

1. Stem hirsute; leaves entire..1. **R. hirta** L.
+ Stem glabrous or sometimes (sparsely) pilose; leaves incised. ....2. **R. laciniata** L.

1. **R. hirta** L. Sp. pl. (1753) 907; DC. Prodr. V, 556; Britton and Brown, Ill. Fl. North. Unit. Stat. III (1913) 470; Hegi, Ill. Fl. VI, 1, 505; Vizn. Rosl. URSR, 534; Fernald, Gray's Manual of Botany (1950) 1484; Kirpiczn. in Majevsk. Fl., Izd. 8, 574. —**Ic.**: Britton and Brown, op. cit.: Hegi, op. cit. fig. 255; Fernald, op. cit. fig. 1738.

Annual or perennial. Stem (10)20–90(100) cm high, erect, simple or branched, hirsute. Leaves alternate, with three distinct longitudinal veins, lower ones oblong-spatulate tapered to winged petiole, upper ones sessile, lanceolate (sometimes ovate); all leaves densely hirsute, entire or remotely toothed. Capitula solitary, long-pedunculate, large; outer involucral bracts herbaceous, oblong, more or less recurved, inner ones shorter, linear-lanceolate to linear; all bracts hirsute, linear, at apex pubescent. Ligulate florets light yellow, 2–4 cm long; inner (tubular) florets blackish-brown or blackish-purple, style branches horizontal, subulate. Achenes tetrahedral, without pappus. Flowering VI–X.

Cultivated as an ornamental plant; sometimes found in fields (e.g., 540 clover fields) as an accidental weed; originates from North America. *General distribution*: Cultivated all over the world. Described from North America. Type in London.

2. **R. laciniata** L. Sp. pl. (1753) 906; DC. Prodr. V, 555; Hoffm. in Pflanzenfam. IV, 5 (1894) 233; Britton and Brown, Ill. Fl. North. Unit. Stat. III (1913) 473; Hegi, Ill. Fl. VI, 1, 503; Vizn. Rosl. URSR, 534; Fernald, Gray's Manual of Botany (1950) 1481; Kirpiczn. in Majevsk. Fl. Izd. 8, 574; **Ic.**: Britton and Brown, op. cit.; Hegi, op. cit. fig. 256, 257; Fernald, op. cit. fig. 1726.

Annual or perennial. Stem erect, glabrous, glaucous, 50–200(300) cm high, branched above. Leaves alternate, glabrous or sparsely pilose; lower leaves petiolate, simple or pinnately divided, with oblong-lanceolate or lanceolate-acute, irregularly erose-toothed to divided and dissected segments, numbering two or three pairs of lateral ones and a trisected terminal one; middle leaves two- to three-pinnate, upper three-pinnate; uppermost leaves simple, ovate, acute, with occasional teeth or entire. Capitula solitary, long-pedunculate, large, 7–12 cm wide. Involucral bracts oblong-ovate, recurved; ligules of peripheral florets golden-yellow, 6–8 cm long, usually decurved, considerably exceeding involucral bracts; central (tubular) florets greenish yellow or brownish (in double forms, all florets golden-yellow). Achenes glabrous, compressed, tetrahedral, cuneate, about 5–6 mm long, with pappus in form of small four-toothed corona. Flowering VII–X.

Cultivated everywhere as an ornamental plant, originating from North America. *General distribution*: Cultivated in all parts of the world. Described from North America. Type in London.

GENUS ***Echinacea** Moench [1, 2]

Moench, Meth. (1794) 591.

Capitula many-flowered on long peduncles, nodding; involucre hemispherical, its bracts two to four(five)-rowed, lanceolate, more or less squarrose; receptacle conical, covered with subulate bracts (as a result of longitudinal twisting of initially linear-lanceolate bracts), acuminate, setaceous, usually dark-colored and longer than tubular florets. Ligulate florets with abortive pistil, persistent; inner florets tubular, bisexual. Achenes obpyramidal, thick, tetrahedral; pappus in form of small, toothed corona. Perennial herbs with simple or weakly branched stem and alternate (sometimes opposite), simple, toothed or entire leaves with three to five longitudinal veins.

541 1. **E. purpurea** (L.) Moench Meth. (1794) 591; DC. Prodr. V, 554; Britt. and Brown, Ill. Fl. North Unit. Stat. III (1913) 475; Fernald, Gray's Manual of Botany (1950) 1485. —*Rudbeckia purpurea* L. Sp. pl. (1753) 907; Hoffm. in Pflanzenfam. IV, 5 (1894) 233; Katina in Vizn. Rosl. URSR (1950) 534. —**Ic.**: Britt. and Brown, op. cit.; Hoffm. op. cit., fig. 115, W.

Perennial. Stem glabrous or sparsely pubescent, 50–100(150) cm high. Leaves scabrous, often toothed; lower leaves ovate, on long, winged petioles, acute, usually with five longitudinal veins, at base abruptly narrowed to weakly cordate, 5–15(20) cm long, 2.5–7.5 cm wide; upper leaves lanceolate or oblong-ovate, sessile or subsessile, three-veined. Ligulate florets 15–20, purple, crimson, or sometimes whitish, 2.5–5.5

[1] Treatment by I.T. Vassilczenko.

[2] From the Greek word *echinos*—spiny (bracts spiny, acicular-acuminate).

cm long; inner (tubular) florets purple, 4 mm long, greenish; bracts lanceolate-subulate, 1.0–1.3 cm long, 1.0–1.5 mm wide, with straight spiny apex. Flowering VI–X.

Cultivated as an ornamental plant; originating from North America. *General distribution*: Cultivated together with rudbeckia (cf. above). Described from North America. Type in London.

GENUS 1510. **Helianthus** L.[1,2]

L. Sp. pl. (1753) 904

Capitula many-flowered; involucre two- to many-rowed (outer involucral bracts often with herbaceous tip), hemispherical or appressed. Receptacle flat or slightly convex, covered with scaly bracts enclosing achenes. Peripheral florets ligulate, sterile; inner (tubular) florets bisexual, fertile. Achenes cuneate or obovate, compressed or usually angular; pappus of small, deciduous scales. Annual or perennial herbs, sometimes developing underground tubers, with erect stem; leaves alternate or opposite, simple, toothed, sometimes almost entire.

Economic Importance. The genus includes, on the one hand, highly valuable oilseed species like *H. annuus* L., widely cultivated in the more southern regions of the USSR, and on the other hand, it has species with great importance as food plant (*H. tuberosus* L.). Some species of the genus are known as noxious weeds, such as the North American *H. maximiliani* Schrad.—a small-flowered (capitula 2–3 cm wide) short-rhizomatous species included in our list of foreign elements for quarantine. The group of ornamental sunflowers is quite large (it includes *H.* 542 *decapetalus* L., *H. argophyllus* Torr. and Gr., *H. cucumerifolius* Torr. and Gr., ornamental forms of *H. annuus* and others); however, in our country the ornamental species are found only rarely; the relatively more widely distributed of them is *H. atrirubens,* included by us in the "Flora of the USSR" (see below).

1. Annual plants; capitula very large, (6)10–50 cm wide .... 1. **H. annuus** L.
+ Perennials; capitula not so large 2
2. Plant developing underground tubers; both ligulate and tubular florets yellow .... 2. **H. tuberosus** L.
+ Plant without tubers; ligulate florets yellow, tubular florets reddish-purple .... 3. **H. atrirubens** L.

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[1] Treatment by I.T. Vassilczenko.

[2] From the Greek word *helios*—sun, and *anthos*—flower.

1. **H. annuus** L. Sp. pl. (1753) 904; DC. Prodr. V, 585; Hoffm. in Pflanzenfam. IV, 5, 235; Schmalh. Fl. II, 56; Britton and Brown, Ill. Fl. North Unit. Stat. III (1913) 478; Hegi, Ill. Fl. VI, 1, 510; Watson E.E. in Papers Michig. Ac. Sc. IX (1928–1929) 357; Grossh. Fl. Kavk. IV, 114; Fl. Yugo-Vost. VI (1936) 330; Vizn. Rosl. URSR (1950) 533; Fernald, Gray's Manual of Botany (1950) 1490; Majevsk. Fl. SSSR, Izd. 8, 575. —*H. indicus* L. Mant. pl. I (1761) 114. —*H. platycephalus* Cass. Dict. Sci. Nat. 22 (1821) 352. —*H. multiflorus* Hook. Fl. Bor. Amer. I (1840) 313. —*H. cultus* Wenzl. in Kul't. Fl. SSSR, VII (1911) 382; Grossh. Opredel. Rast. Kavk. (1949) 450. —*H. ruderalis* Wenzl. l. c. 430. —**Ic.**: Britton and Brown l. c., fig. 4461; Wenzlawowicz op. cit. Fig. 162–189.

Annual. Stem usually simple, coarse, with loose white pith, scabrous, (20)50–250(300) cm (and more) high. Leaves cordate-ovate (upper ovate), alternate, large, subacute (to acute), finely serrate-toothed, with three longitudinal veins, setose on both sides. Capitula large (from 6–10 to 50 cm wide), nodding; involucral bracts imbricate, ovate, acute, green, hirsute; ligulate florets usually yellow, sometimes pale pinkish-yellow or reddish, sterile, numerous, oblong-oval to oblong, large (5–10 cm long); central florets tubular, bisexual, sometimes pistillate, brownish-yellow, or pale pinkish-yellow, sometimes reddish; receptacle almost flat or weakly convex. Achenes obovoid or cuneate, often laterally compressed, more or less ribbed and hairy, variously colored (white, gray, black, striped, etc.), at apex with one or two (sometimes more) bristles or scales, with woody pericarp. Flowering VII–IX.

Cultivated mainly in the more southern regions of the USSR; originating from America. *General distribution:* Cultivated in all parts of the world.

Economic Importance. The common sunflower is one of the most important and widespread oilseed plants of the USSR; it is also used 543 green to make silage, while its coarse and thick stems (after harvesting seeds) go for fuel (in unwooded steppe regions) and also are used for light summer constructions and temporary hedgerows; sunflower oilcake is a valuable concentrate for cattle. The fruits (achenes) of the sunflower are also a quite popular delicacy; the seeds when shelled out of the hard seed coat and roasted (browned) slightly have a unique aroma and taste, yielding nothing to the taste of, for example, the common forest nuts—hazelnut (*Corylus avellana* L.). The sunflower is also widely known as a nectariferous and ornamental plant, a traditional added touch to the little gardens in front of the houses in the Ukraine, Don, and other southern regions. An extract from the flowers is used in medicine (sunflower drops).

The ornamental forms of the sunflower are characterized by great variety in flower color, which can be almost white, straw-colored, yellow, orange-yellow, wine red, cherry-red, etc., or variegated in different combinations of the basic colors. Sometimes, for example, the base and the tip (of the ray florets) are straw-colored (or yellow), but the middle portion is cherry-red (or wine-red), etc. The ornamental forms have small capitula (4–12 cm wide) and small (5–7 mm) easily dehiscent achenes; a double form of the flower is often observed.

Note. Wenzlawowicz (1941) places annual cultivated forms of the sunflower in the species *H. cultus* Wenzl. and the wild (also annual) American forms in the species *H. ruderalis* Wenzl. According to Wenzlawowicz, the characteristic features of the latter species are: small achenes (3–6 mm long), dehiscing during maturation; the main capitulum of the same size as the laterals; all capitula small. In *H. cultus* the achenes are larger (6–25 mm long) and weakly dehiscent or indehiscent; the main capitulum is larger than laterals; and the capitula are larger. However, later, in describing the varieties of *H. cultus*, Wenzlawowicz indicates small achenes for some of the varieties (4–6 or 6–8 mm long, e.g., in *H. cultus* ssp. *ornamentalis* grex *ramosissimus*, on p. 410), and, thus, this character loses its value for distinguishing between the two species. The other characters mentioned above seem to us just as relative, particularly considering the sympatric geographic ranges of *H. ruderalis* and *H. cultus*. American authors (for example, Fernald, 1950) place the wild and cultivated forms of this plant in the same species (*H. annuus* L.). The monographer of this genus N. [E.] Watson (l. c. 359) observed in North America all possible intermediates between the wild and cultivated forms of *H. annuus,* and he considers the splitting of them into different species to have little basis (such proposals were made by some American authors even before Wenzlawowicz).

For practical purposes all sunflower cultivars are generally divided into three groups: 1) edible cultivars (large-seeded); 2) oilseed cultivars (small-seeded); and 3) intermediates between the other two ("mezheumki").
544 The attempts of E.M. Platschek to segregate the edible cultivars as a separate species (*H. macrospermus* Platsch.) and to transfer the oilseed cultivars to another species (*H. oleiferus* Platsch.) cannot be considered well founded (for details, see Wenzlawowicz, l. c. p. 384).

2. **H. tuberosus** L. Sp. pl. (1753) 905; DC. Prodr. V, 590; Hoffm. in Pflanzenfam. IV, 5 (1894) 236; Schmalh. Fl. VI, 1, 56; Britton and Brown, Ill. Fl. North. Unit. Stat. III (1913) 486; Hegi, Ill. Fl. VI, 1, 514; Watson, E.E. in Papers Mich. Acad. Sc. IX (1928–1929) 433; Fl. Yugo-Vost. VI (1936) 330; Vizn. Rosl. URSR (1950) 533; Fernald, Gray's Manual of Botany (1950) 1493; Majevsk., Izd. 8, 575. —*H. esculentus*

Warcz. in Allgem. Gartenz, 20 (1852) 293. —*H. serotinus* Tausch, Flora II (1828) 504. —**Ic.**: Britton and Brown, op. cit. fig. 4486.

Perennial. Stem erect, branched, 1–3(5) m high, hirsute, producing short, underground shoots (rhizomes) with sessile tubers. Lower leaves opposite, petiolate, cordate-ovate, coarsely serrate-toothed; upper leaves alternate, more elongated, oblong-ovate or lanceolate; all leaves hirsute on both sides with three longitudinal veins. Capitula relatively small, erect, 2–5 cm wide (rarely larger). Involucral bracts lanceolate, green, dorsally finely appressed-hairy and along margin hirsute; floral bracts oblong-spatulate, acute, hairy in upper part. Ligulate florets 12–15, golden yellow; disk (tubular) florets yellow. Achenes fine-cuneate, finely pilose, apically with one to four small, subulate scales. Flowering VIII–IX.

Cultivated (for the tubers) as a valuable food plant. *General distribution:* Cultivated in various countries; originates from North America. Described from Brazil. Type in London.

3. **H. atrirubens** L. Sp. pl. (1753) 906; DC. Prodr. V, 586; Britton and Brown, Ill. Fl. North. Unit. Stat. III (1913) 486; Fernald, Gray's Manual of Botany (1950) 1491. —*H. silphioides* Nutt. in Trans. Am. Phil. Soc., 7 (1846) 366. —**Ic.**: Britton and Brown, op. cit., fig. 4465.

Perennial. Stem 50–150 cm high, branched, pubescent, particularly below, developing short, horizontal, underground rhizomes. Lower leaves large, opposite, upper reduced, alternate, ovate or oblong-ovate, at base more or less cordate, on winged petioles, hirsute on both sides, beneath along veins more or less tomentose, toothed or crenate-toothed. Capitula solitary, terminal, about 1.5–2.0 cm wide; involucre of oblong-ovate or lanceolate, hirsute, acute bracts; ligulate florets yellow; inner (tubular)
545 florets reddish-purple. Receptacle convex, floral bracts two- or three-toothed (outer weakly dentate). Achenes finely cuneate, about 3(4) mm long, densely pilose. Flowering: VI.

Cultivated as an ornamental plant in western Turkmenia. *General distribution:* North America, cultivated in other countries, mostly of the temperate zone. Described from North America. Type in London.

Note. Our plant differs in a number of characters from typical *H. atrirubens* L.; for example, long-acuminate (and not obtuse or short-acuminate) involucral bracts, basally more deeply notched (cordate) (and not rounded or weakly cordate) leaves, and some other characters. Nevertheless, because of insufficient material (at our disposal were only the upper parts of two plants from Turkmenia), we are retaining in this case the specific epithet (*H. atrirubens* L.).

Subtribe 4. **COREOPSIDINAE** O. Hoffm. in Pflanzenfam. IV, 5 (1889–1894) 239. —Capitula heterogamous or homogamous. Peripheral florets pistillate, fertile or sterile because of reduction; disk florets bisexual, fertile or innermost florets sometimes sterile. Receptacle squamose. Pappus absent or represented by few (usually two) teeth or awns.

GENUS ***Guizotia** Cass. [1, 2]

Cass. in Bull. Soc. Philom. (1827) 127

Capitula in lax paniculate inflorescences; involucre campanulate or hemispherical, two-rowed. Receptacle convex or conical, squamose. Ligulate florets yellow, usually less numerous, pistillate; central (tubular) florets yellow, bisexual. Achenes small, lustrous, dark-colored, cuneate. Annual or perennial herbs with erect, branched stem and opposite leaves (alternate in upper part), simple and entire, rarely three-parted, remotely toothed, sometimes almost entire.

1. **G. abyssinica** (L.f.) Cass. Dict. Sc. Nat. 59 (1829) 248; Hook, Fl. Brit. Ind. III, 38; Hoffm. in Pflanzenfam. IV, 5, 242; Hegi, Ill. Fl. VI, 1, 532; Fernald, Gray's Manual of Botany (1950) 1405; Sharapov in Kul't. Fl. SSSR, VII (1941) 462. —*G. oleifera* DC. Prodr. V (1836) 551. —*Polymnia abyssinica* L.f. in Suppl. (1781) 386. —*Tetragonotheca abyssinica* Ldb. Ind. Hort. Dorpat. Suppl. (1824) 7. —*Ramtilia oleifera* DC. in Wight Contrib. bot. (1834) 18. —**Ic.**: Hoffm. op. cit. fig. 119, A; Sharapov, op. cit., Fig. 203, 204; Hegi op. cit. fig. 270.

546 Annual. Stem 30–50 cm to 1.0–1.5(2.0) m high, almost glabrous, more or less pilose above. Leaves sessile (lower leaves petiolate), oblong-ovate or lanceolate, semiamplexicaul, acuminate, glabrous above, usually more or less pubescent beneath (particularly along veins). Capitula 2–5(6) cm wide, on long (sometimes short) pubescent peduncles; outer involucral bracts ovate or broadly oval, herbaceous, inner narrower, scarious; ligulate florets with short tube and three-toothed limb, pubescent throughout or only at base of ligule and in its lower part; central (tubular) florets pubescent like ligulate florets, five-toothed or lobed. Achenes without pappus, outer three-angled, inner usually tetrahedral, 3–6 mm long, 1.5–3.0 mm wide, obpyramidal, almost rhombic or triangular in cross section, brown or black, with thin pericarp. Flowering VIII–IX.

Cultivated at a number of experimental stations in southern regions of the USSR; reported as an introduced (weedy) plant from the Kaliningrad

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[1] Treatment by I.T. Vassilczenko.

[2] Named after F.P.G. Guizot (1787–1874), French historian and state official.

Region. *General distribution*: Africa, mountainous regions of Abyssinia, Eritrea and eastern Africa; cultivated in India and other southern countries; an introduced weed in North America and western Europe. Described from Abyssinia. Type in London.

Economic Importance. A valuable oilseed plant; its oilcake is highly suitable as a concentrate for feeding cattle. The oil yield from seeds varies from 30 to 50%. It is an extremely promising plant for cultivation in the south of the USSR.

GENUS *Coreopsis L.[1,2]

L. Sp. pl. (1753) 907

Capitula many-flowered; ligulate florets usually eight (sometimes absent), one-whorled, sterile; inner [disk] florets bisexual, tubular, five-toothed. Involucre two-rowed, with eight bracts in each row; outer bracts herbaceous, narrow, lax, inner oblong-ovate, appressed, scarious along margin. Receptacle flat, covered with thin, linear-subulate to filiform bracts [chaff] falling with achenes. Achenes flat, fusiform, or obovate, with two teeth or awns at apex, sometimes without. Herbs, semishrubs, or shrubs with opposite (sometimes alternate) petiolate, palmately divided to incised leaves.

1. Achenes oval or obovate, convex-concave [arched]............ ....1. **C. grandiflora** Hoog.
547 + Achenes narrow and long, fusiform..................2. **C. tinctoria** Nutt.

1. **C. grandiflora** Hoog. in Sweet. Brit. Fl. Gard. 2 (1825–1827) 175; DC. Prodr. V, 572; Britt. and Brown, Ill. Fl. North Unit. Stat. III (1913) 491; Hoffm. in Pflanzenfam. IV, 5, 235; Terekhov in Opredel. Vesen. i Osen. Rast. (1939) 229; Vizn. Rosl. URSR (1950) 134; Fernald, Gray's Manual of Botany (1950) 1498; Pidotti, Opredel. Semyan Dekor. Rast. (1952) 88.—**Ic.**: Hoffm. op. cit. 118, a; Britt. and Brown, op. cit., fig. 4495; Pidotti op. cit., Plate XXIX, 1.

Annual or perennial. Stem erect, branched, slightly sulcate, glabrous, 20–100 cm high, with long (10–15 cm), virgate peduncles. Leaves opposite, sessile, upper 3–5-parted, middle two- (or repeatedly) parted, with entire, narrowly linear or linear-lanceolate segments [leaflets], usually 1–5 mm wide; lower leaves with oblong segments, sometimes entire.

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[1] Treatment by I.T. Vassilczenko.

[2] From the Greek words *coris*—bug, and *opsis*—exterior or appearance (from the shape of the fruit).

Capitula up to 5 cm wide, solitary terminal; outer involucral bracts lanceolate-subulate, acute, ciliate, as long as inner bracts; ligulate florets 1.3–2.5 cm long, yellow (like tubular florets); bracts [pales] 6–7 mm long. Achenes ovoid or obovoid, finely tuberculate, swollen at both ends, convex-concave [arched], broadly margined (winged), hence boat-shaped, 2.5–3.0 mm long and almost as wide, dark olive-brown. Flowering VI–VIII.

Cultivated as an ornamental plant, mostly as annual. *General distribution*: North America; cultivated in other countries as an ornamental plant. Described from North America. Type in Philadelphia (USA).

2. **C. tinctoria** Nutt. in Journ. Acad. Sc. Philadelph. 10 (1821) 114; Hoffm. in Pflanzenfam. IV, 5, 243; Britt. and Brown, Ill. Fl. North Unit. State. III (1913) 493; Terekhov in Opredel. Vesenn. i Osenn. Rast. (1939) 229; Vizn. Rosl. URSR (1950) 543; Fernald, Gray's Manual of Botany (1950) 1498; Pidotti, Opredel. Semyan, Dekor. Rast. (1952) 88. — *Calliopsis tinctoria* DC. Prodr. V (1836) 568. —**Ic.**: Hoffm. op. cit. fig. 118, R; Britt. and Brown, op. cit. fig. 4503; Pidotti, op. cit., Plate XXIX, 4.

Annual or perennial. Stem glabrous, 30–100 cm high, branched, with many slightly angular offshoots. Leaves opposite; basal and lower cauline leaves pinnately divided, with linear or linear-lanceolate segments, sometimes divided further; upper cauline leaves—one or two, pinnately divided or cut, uppermost leaves entire. Capitula numerous, in corymbose or corymbose-paniculate inflorescence, on more or less long peduncles; outer involucral bracts oblong-linear or almost triangular, usually cartilaginous along margin, about 2 mm long, inner ovate 5–6 mm long; ligulate florets yellow, orange, or bicolored or dark purple-brown, 548 with three-lobed obovate ligule, 7–15 mm long; bracts [pales] almost filiform, 4.0–4.5 mm long; disk florets usually dark red. Achenes fusiform, more or less curved, sometimes straight, 2.3–2.7 mm long, 0.7–1.0 mm wide, black or dark brown, finely tuberculate, with two short, fragile, 0.3–0.5 mm long, awns at apex. Flowering VI–IX.

Cultivated as an ornamental. *General distribution*: North America; cultivated in several other countries. Described from North America. Type in Philadelphia (USA).

Note. Apart from the above species, *C. basalis* (Dietr.) Blake [*C. drummondii* (D. Don) Torr. and Gr.] also is found in cultivation, which differs from *C. tinctoria* Nutt. by broader (lanceolate or oblong-ovate to rotund) segments of the leaves, larger (13–23 mm long) ligulate florets, and obovoid, carinately impressed and marginate achenes, 1.8–2.4 mm long, 1.8–2.0 mm wide.

GENUS *Dahlia Cav.[1,2]

Cav. Ic. et decr. pl. I (1791) 56. —*Georgina* Willd. Sp. pl. III (1803) 2124.

Capitula large, usually nodding, on long peduncles; involucre of outer row of few, revolute, herbaceous, bracts and inner row of oblong bracts, at base more or less connate, at apex scarious, usually almost two-rowed. Receptacle flat with large membranous bracts. Peripheral florets ligulate, pistillate or sterile; inner florets tubular, bisexual, double forms of the flowers not rare. Achenes flat, cuneate, without or with remains of pappus in form of two teeth. Perennial herbs with rhizomes developing long tubers, with opposite, pinnately cut leaves and toothed (to pinnatifid and pinnate) segments; sometimes simple leaves also found along with pinnate leaves; stem glabrous (as also whole plant).

1. **D. pinnata** Cav. Ic. et decr. pl. I (1791) 57; Bailey, Stand. Cyclop. Horticult. (1922) 952; Terekhov, Opredel. Vesen. i Osen. Rast. (1939) 230; Chittenden, O.B.E. Dict. of Gard. (1952) 633; Pidotti, Opredel. Semyan Dekor. Rast. (1952) 91. —*D. rosea* Cav. Icon. et decr. pl. III (1794) 33. —*D. purpurea* Poir. Encycl. meth. Suppl. II (1811) 444. —*D. yarezii* Hort. ex Gard. Chron. II (1879) 432. —*D. coccinea* Cav. Icon. et decr. pl. III (1794) 33. —*D. variabilis* (Willd.) Desf. Cat. pl. hort. Paris, ed. 3 (1829) 182; DC. Prodr. V, 494; Hoffm. in Pflanzenfam. IV, 5, 243; Hegi, Ill. Fl. VI, 1, 510; Shelyuto in Botan. Zhurn. 2 (1932) 203; Vizn. Rosl. URSR (1950) 534. —*Georgina variabilis* Willd. Sp. pl. III (1800) 2124. —**Ic.**: Cav. op. cit. I, tab. 80, III, tab. 265 (sub *D. rosca*
549 Cav.); tab. 266 (*D. coccinea* Cav.); Shelyuto, op. cit., Fig. 1–15; Pidotti, op. cit., Plate XXIX, Fig. 5.

Perennial. Stem erect, more or less woody at base, hollow, 1.5–2.0 m high, or not branched. Leaves pinnate (sometimes bipinnate); leaflets ovate, oblong-ovate, often attenuated at tip, serrate-toothed, usually five. Capitula large, long pedunculate, nodding; ligulate florets in one or several rows or all florets ligulate (in double forms), variously colored, sometimes surprisingly modified (rolled into tube or cup-shaped, etc.). Achenes cuneate, 9–12 mm long, 3–4 mm wide or oburceolate, flattened. Flowering in second half of summer and in fall.

Cultivated throughout the USSR as one of the most popular ornamental plants. *General distribution*: Cultivated all over the world; originating from Mexico. Described from a cultivated plant grown in Madrid. Type in Madrid(?).

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[1] Treatment by I.T. Vassilczenko.

[2] Named in honor of Andreas Dahl, one of the pupils of Linnoeus, who taught botany in Abo (Finland) and died in 1787.

Note. The taxonomy of the genus (at least with respect to the cultivated species of this genus, which are of the greatest interest to us), despite the wide reputation of this first-class ornamental plant, still remains inadequately worked out. Some taxonomists distinguish a number of species (see below), while others (in particular, Soviet taxonomists) generally mention only one species—*D. pinnata* Cav. (=*D. variabilis* Willd.) Bailey (1922), in his *Garden Encyclopedia* (l. c.), as well as Seymour (Seymour, E.L.D. *The New Garden Encylopedia*, 1946) recognize two species of dahlias (Bailey—*D. rosea* Cav. and *D. juarézii* Hort.; Seymour—*D. pinnata* and *D. juarézii*). But in the latest revision of Chittenden (1951) four species are given (*D. coccinea, D. juarézii* Hort., *D. pinnata* and *D. rosea*).

Unfortunately, these species, possibly more clearly delimited in the regions where they were originally cultivated, often are linked in our area with whole series of intermediate hybrid forms and lose the necessary sharpness of their limits. The fixation of intermediate and generally variant (from type) forms is made possible by the vegetative propagation of the dahlias (by tubers) that is generally practiced. Besides, in the process of cultivation, emergence of new characters among the dahlias is observed. Thus, for example, according to Chittenden (l. c.), in *D. coccinea* in the wild the ligulate florets are sterile, but, under cultivation, fertile. The garden varieties of dahlia introduced in the USSR were subjected here to new changes, a new wave of hybridization (artificial and natural), with the evolution of many new forms (varieties), and the history of their origin still awaits detailed studies. Here it is also necessary to note that all the cited species of dahlia are being cultivated in the very same regions, and there is no need to talk about any kind of ecogeographical isolation of these forms. All this has served for the present as a basis for
550 the author to restrict himself to recognizing only one "principal" species of dahlia (*D. pinnata*), leaving the detailed working out of the systematics of dahlia to the future.

At present more than, 3,000 dahlia cultivars are known, which are categorized in groups of cultivar types (the "classes" of English and American authors). The number of these groups varies in the treatments of different authors from 7–8 to 11–13 and more. As the most important (principal) groups of cultivars, we will mention the following classes:

1) *Single Dahlias:* With single-rayed capitula (with a well developed disk, formed by tubular florets) and one row of ligulate florets with a flat ligule. The anemone-flowered dahlias are close to this class in which, however, an increased number of ligulate florets (often in more than one row) is observed.

2) *Colarette Dahlias:* It is natural for the representatives of this class to have one to several rows of reduced ligulate florets (with a short ligule) alternating with rows of normal, long ligulate florets; there is a disk composed of tubular florets.

3) *Cactus Dahlias*: With double-rayed capitula in which the ligules are rolled into narrow, subulate tubes; the florets are compacted to form a "head" in the center of capitulum. Thus the whole flowering capitulum from a distance resembles a globose cactus covered with spines. The class of Semi-cactus Dahlias, with the corollas less recurved, weakly twisted (up to half the length) and broadened downward, approaches this class. *D. juarézii* is considered to be the parent of the cactus dahlias.

4) *Show Dahlias*: Capitula double-rayed, large (more than 7–8 cm wide), with the corollas recurved along the margin, broadly tubular or cup-shaped toward the tip. The so-called Pompon Dahlias, which differ from the Show Dahlias by having smaller capitula (but usually more than 5 cm), and the Fancy Dahlias, with heterogeneously varicolored florets, can also be included in this class.

5) *Formal Decorative Dahlias*: With double-rayed capitula with flat or just slighlty recurved corollas, rounded or more or less acute at tip. Close to this is the class of Informal Decorative Dahlias, in which the florets are borne irregularly and the capitula look as if "unraveled," while the florets themselves (their ligules) are flat or weakly twisted and more or less acuminate.

6) *Star Dahlias*: With small capitula having 2–3 rows of acuminate ligules, more or less recurved along the margin and with a central disk composed of tubular florets.

551 Besides, there are a number of classes of dahlias of secondary importance or that are subordinate to the listed, basic classes.

GENUS 1511. **Bidens** L.[1,2]

L. Sp. pl. (1753) 832

Capitula many-flowered with two-rowed involucre; outer involucral bracts green, herbaceous, inner ones black or brownish-green, along margin yellow, shorter than the outer bracts. Florets tubular, bisexual, sometimes with a few sterile, ligulate florets. Receptacle covered with oblong scaly bracts, flat. Achenes cuneate or obpyramidal, four-angled, oblong, linearly terete, rod-shaped, glabrous or more or less pilose, with two to four

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[1] Treatment by I.T. Vassilczenko.

[2] From the Latin words: *bis*—double, and *dens*—tooth (at the tip of the fruit there are two to four spiny processes).

short awns at apex, covered with downward directed aculeate bristles, usually also along edge of achenes (or along fine ribs), achenes brownish-greenish-dark-brown, grayish-brown to almost black or much lighter-brown. Annual plants with adventitious roots and opposite leaves (sometimes upper leaves alternate).

Note I. *Bidens* is among those genera that are quite complex to study. First of all it is necessary to note here the frequent occurrence of dwarf, apparently reduced forms of uncertain taxonomic rank in the majority (if not all) of the species of the genus known to us (see the note under *B. tripartita* below). Attempts to define more precisely the taxonomic position of these forms without special investigations and experiments are premature. The genus *Bidens* belongs with the "amphibious plants." Its species, being, in fact semi-aquatic, can also grow in marshes, and sometimes, in the form of floating stems with a cluster of hanging roots, they also pass over to the aquatic mode of life. The biology of the beggar-ticks in our circumstances still is almost entirely unstudied, which also complicates the taxonomy of the wetland and aquatic forms of this plant. Proposals for relegating the floating plants of beggar-ticks to definite forms (as taxonomic units, e.g., *B. cernuus* f. *natans* Osw. and Kling.), seem quite formal to us. In a number of species of *Bidens* the behavior of the ligulate florets is very interesting—these florets are present in some plants, absent in others (within the same species); the variation in the form of the leaves in the beggar-ticks (degree of their dissection and even their position on the stem) should also be pointed out here. Possibly, this is a result of the hybridization observed among species of beggar-ticks, about which even Linnaeus wrote.

Note II. In the work of Schmalhausen (*Fl.* II, 58) there is a reference 552 to an occurrence of *B. leucantha* Willd. in the USSR ("once found wild near Riga"). However, as this species was not collected later by anyone in our country and is not reported at present from the Baltic Region, I considered it unnecessary to include it among the species of Flora of the USSR. However, this question (as well as the others stated needs separate investigation).

The Polish botanist J. Kornas discovered in Brest (Byelorussian SSR) in the ditches along the railroad embankment one more species of the genus, viz., *B. melanocarpa* K.M. Wieg., evidently introduced from Poland, where of late it is spreading. *B. melanocarpa*, a North American plant, known in western Europe as an adventive since the end of the 19th century, is distinguished from the closely related species *B. tripartita* by more deeply, four- or five-cut leaves and, mainly, by finely barbate achenes.

Economic Importance. The beggar-tick (mainly *B. tripartita, B. cernua*, and *B. radiata*) formerly was used in medicine ("Herba et Flores

Bidentis") and was well known as a long-standing folk medicinal remedy. This plant also is used, perhaps, as a source of yellow dye for cloth. Beggar-ticks are quite common in our country as weeds; however, their role in this regard is insignificant.

Fruits of the following species are known in fossil form: *Bidens cernua* L. in the Lower Pleistocene of the Lower Volga (P.I. Dorofeev) and in the Upper Pleistocene deposits at the village of Priyar in the Upper Don (P.A. Nikitin) and the city of Galicha (P.I. Dorofeev); *B. radiata* Thuil. in the Lower Pleistocene deposits of the Lower Volga (P.I. Dorofeev); *B. tripartita* L. in the Lower Pleistocene of the Lower Volga (P.A. Nikitin, P.I. Dorofeev) and Irtysh (P.A. Nikitin) and in the Upper Quaternary deposits of the Upper Don (P.A. Nikitin); *Bidens* sp. in the Upper Quaternary deposits of the Khopyor River (P.A. Nikitin).

1. Achenes cuneate, compressed, with two awns (sometimes three or four, but then two of them longer than others) at apex..............2
+ Achenes three- or four-angled, obpyramidal, with four equal awns (plant with entire leaves), or linear-cylindrical, "rod-like" (leaves incised), with two to four awns..............6
2. Achenes entirely covered with appressed hairs..............6. **B. frondosa** L.
+ Achenes glabrous, downward directed bristles only along edges (and awns)..............3
3. Achenes usually undulate, finely tuberculate, sometimes erose, leaf segments long and narrow, linear-oblong or linear-lanceolate to linear..............5. **B. maximovicziana** Oett.
555 + Achenes without tubercles; leaf segments broader or leaves simple..............4
4. Leaves oblong, undivided; achenes 3 mm long..............2. **B. kamtschatica** Vass.
+ Leaves usually divided or incised, sometimes together with undivided leaves, very rarely all leaves undivided; achenes larger..............5
5. Capitula wide, somewhat flat (wider than long), outer involucral bracts 9–14; pales longer than achenes (including awns) or equal..............4. **B. radiata** Thuill.
+ Capitula as wide as long; outer involucral bracts five to eight; pales as long as achenes (excluding awns).......3. **B. tripartita** L.
6. Achenes obpyramidal, with four equal awns at apex; leaves undivided, sparsely serrate-toothed..............1. **B. cernua** L.
+ Achenes linear-cylindrical or rod-like; leaves incised to compound..............7
7. Terminal segments of leaves narrow, linear or linear-lanceolate

to lanceolate..7. **B. parviflora** Willd.

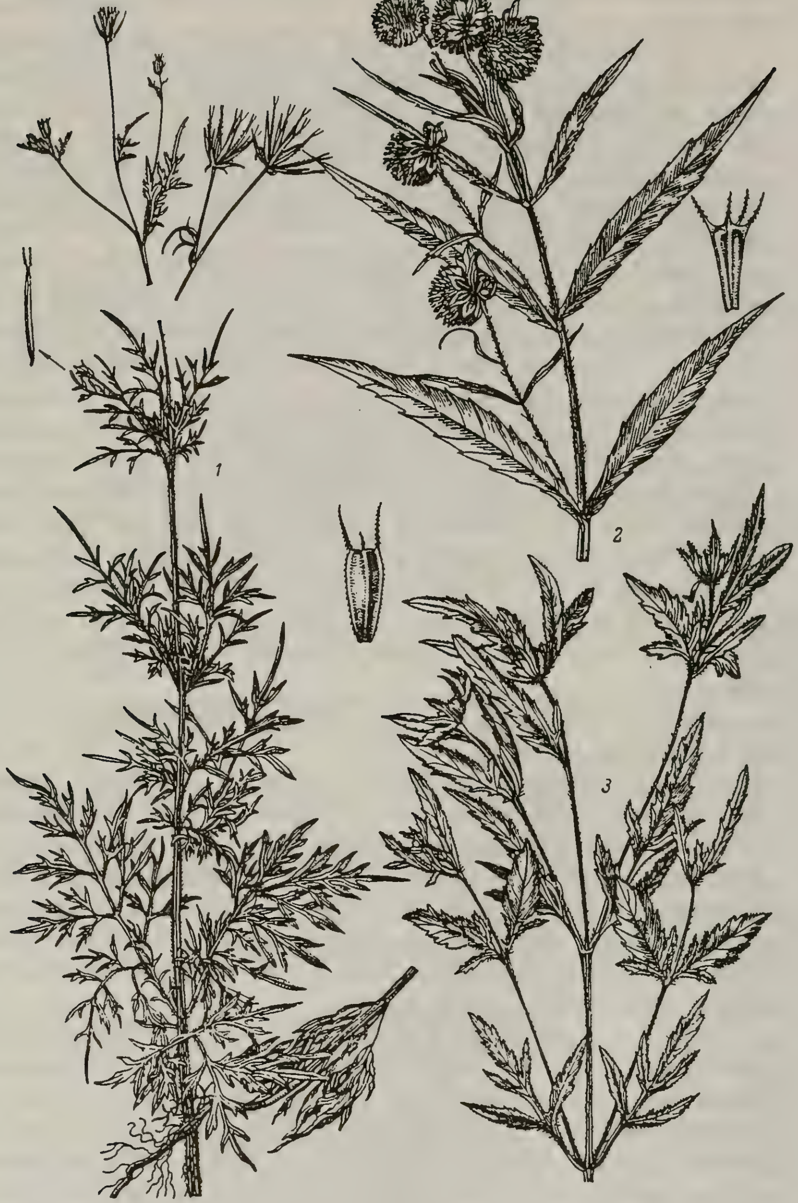
+ Terminal segments of leaves broadly ovate.......8. **B. bipinnata** L.

1. **B. cernua** L. Sp. pl. (1753) 832; DC. Prodr. V, 594; Ldb. Fl. Ross. II, 2, 517; Boiss. Fl. or. III, 250; Hoffm. in Pflanzenfam. IV, 5, 244; Schmalh. Fl. II, 58; Britton and Brown, Ill. Fl. North Unit. Stat. III (1913) 495; Hegi, Ill. Fl. VI, 1, 521; Kom. and Alis. Opredel. Rast. Dalnevost. Kr. II, 1025; Grossh. Fl. Kavk. IV, 114; Krylov, Fl. Zap. Sib. XI, 2718. —**Ic.**: Britton and Brown, l. c.; Hegi, l. c. tab. 263, fig. 2; Fl. Yugo-Vost. VI, 331. —**Exs.**: GRF No. 1074; Pl. Finl. Exs. No. 386.

Annual. Stem simple or branched above, (5)10–50(90) cm high; glabrous or sparsely glandular-hairy. Leaves sessile, lanceolate or oblong-lanceolate, long-acuminate, remotely serrate-toothed, yellowish-green, 3–4 to 10–12 cm long, base of leaves usually slightly decurrent. Capitula long-pedunculate, quite large and wide (10–20 mm wide), compressed, nodding; outer involucral bracts green, five to nine, oblong-linear, ciliolate, much longer than oblong-oval, grayish-green, inner bracts, almost as long as florets. Florets either all tubular and bisexual or peripheral florets ligulate, sterile with oblong-oval golden-yellow limb (var. *coreopsidis* Dum.); bracts elongate-cuneate, as long as florets. Achenes obpyramidal, inner rhombic in cross section, outer three-angled, with four awns at apex
556 half as long as achenes, along ribs with downward-directed hairs and sometimes, more or less tuberculate. Flowering VII–VIII. (Plate XXXIII, Fig. 2).

Banks of rivers, lakes, marshes, ponds, sometimes found as a weed in wet habitats (banks of canals, etc.). —*European Part*: All regions; *Caucasus*: Ciscaucasia, western and southern Transcaucasia; *Western Siberia*: Upper Tobol, Irtysh, Altai, Ob Region (up to 60° North latitude); *Eastern Siberia*: Angara-Sayans, Dauria; *Far East*: Zeya-Bureya, Uda River area, Ussuri; *Soviet Central Asia*: Aralo-Caspian, Balkhash Region, Dzhungaria-Tarbagatai, Tien Shan. *General distribution*: Scandinavia, Atlantic Europe, central Europe, Mediterranean, Balkans-Asia Minor, Dzhungaria-Kashgaria, Mongolia, Japan, China, North America. Described from western Europe. Type in London.

Note. V.L. Komarov and E.N. Klobukova-Alisova (1932) report from the Far East (from the vicinity of Lake Khanka) one more species of beggar-tick. —*B. graveolens* Kom., which is distinguished from *B. cernua* by more conspicuous pubescence in the upper part of the stem and the presence there of divergent, stiff, thickened hairs and blackish glands. Having examined the authentic material, I came to the conclusion that it is necessary to place *B. graveolens* in *B. cernua* as a variety—*B. cernua* var. *graveolens* (Kom.) Vass. h.l.



553 Plate XXXIII.

1—*Bidens parviflora* L., upper part of plant and achene; 2—*B. cernua* L., same as above.

2. **B. kamtschatica** Vass. sp. nova in Addenda XXIV, 593.

Annual. Stems (5)10–30 cm high, usually simple, more or less reddish (at least above), glabrous or weakly tomentose. Leaves oblong, acute, petiolate, crenate, with short, appressed hairs. Capitula solitary terminal, somewhat flat (wider than long); outer involucral bracts green, oblong, longer than capitulum; inner ones broadly lanceolate, yellow membranous along margin, as long as florets, like linear-lanceolate pales. Achenes flat, broadly cuneate, 3 mm long, 2 mm wide (at upper edge), dark purple, at apex with two distant and somewhat curved (like bull's horns), 1.0–1.5 mm long awns, with dense, rusty, downward-directed hairs along edge, with one weakly protruding, thickened, central rib on wide (lateral) surfaces. Flowering VII–VIII.

Near hot springs on volcanoes. Kamchatka. Endemic. Described from the region of hot springs at the crater of the Uzon Volcano. Type in Leningrad.

Note. B. kamtschatica is an example of local endemism, about which M.G. Popov wrote (see his work "*Endemichnye vidy gryazevogo vulkana Maguntan*" [Endemic Species of the Maguntan Mud Volcano], *Bot. Zhurn.*, 1949, No. 5). This species is close to *B. cernua* L. and *B. connata* Muhl. (a North American species). It is easily distinguished from the former species by the small, flat achenes with two awns, and from second by the smooth, glabrous (not tuberculate and pubescent) and much smaller achenes (2–3 mm long vs. 5.0–7.5 mm in *B. connata*).

557 3. **B. tripartita** L. Sp. pl. (1753) 832; DC. Prodr. V, 594; Ldb. Fl. Ross. II, 2, 516; Boiss. Fl. or. III, 250; Hoffm. in Pflanzenfam. IV, 5, 246; Schmalh. Fl. II, 57; Hegi, Ill. Fl. VI, 1, 516. Kom. and Alis. Opredel. Rast. Dalnevost. Kr. II, 331; Grossh. Fl. Kavk., IV (1934) 114; Sorn. Rast. SSSR, IV (1935) 218; Krylov. Fl. Zap. sib. XI, 2716; Majevski, Fl., Izd. 8, 575; —**Ic.**: Hoffm. op. cit. fig. 118, M; Majevski, op. cit., Fig. 214; Sornye Rasteniya SSSR, Vol. IV, Fig. 458.

Annual. Stem erect (3)15–75(100) cm high, usually dichotomously branched, glabrous or sparsely pubescent. Leaves dark green, opposite (sometimes upper leaves alternate), toothed, usually three- to five-parted into lanceolate or oblong-lanceolate lobes or dissected, with larger terminal lobe—toothed, in turn either cut or divided, and with smaller lateral lobes, at base tapered to short, winged petiole; sometimes leaves (particularly in small reduced specimens or upper cauline leaves), entire, oblong-ovate or lanceolate, irregularly coarsely toothed to incised to different degrees or divided (dissected), mixed with simple, coarse- or incised-dentate ones. Capitula solitary or few, terminal, erect, as wide as long or almost so, measuring 6–15 mm (sometimes more). Outer involucral bracts green, oblong or linear-oblong, herbaceous, five to eight, tapering toward base, spinulose along margin, equaling capitulum or sometimes 2–3 times as long; inner bracts brownish yellow, oval, shorter; pales broadly linear, as long as florets and equaling achenes at fruiting (excluding awns). Ligulate florets usually absent; all florets tubular, yellowish-brown. Achenes cuneate, compressed, usually with one longitudinal rib on flat surface in middle, 5–8(10) mm long, 2–3 mm wide, along margin covered with bright colored downward directed bristles, with two awns at apex, half as long as achenes, less often three or four awns, but then two of them longer than rest. Flowering VII–IX. (Plate XXXIII, Fig. 3).

Marshes, wet Meadows, banks (usually sandy) of rivers, streams, and reservoirs and as a weed in vegetable gardens, irrigated fields, etc. —*European Part:* All regions; *Caucasus; Western* and *Eastern Siberia; Far East; Soviet Central Asia. General distribution:* Atlantic Europe, Mediterranean, Balkans-Asia Minor, Armenia and Kurdistan, Iran, Dzhungaria-Kashgaria, Mongolia, Japan-China, the Himalayas, Iraq, North America, Australia. Described from western Europe. Type in London.

Note. Dwarf plants of this species, with simple leaves and solitary capitula, usually considered by the various authors as varieties (*B. tripartita* var. *pumila* Roth, *B. tripartita* var. *tenuis* Turcz., *B. tripartita* var. *humilis* Roth, *B. tripartita* f. *perpusillus* Domin and others), hardly deserve any
558 special taxonomic distinction. Apparently, they are not more than stunted plants and are related to individual deviations. They are also observed in other species of this genus.

4. **B. radiata** Thuill. Pl. envir. Paris, ed. II (1799) 432; Schmalh. Fl. II, 57; Hegi, Ill. Fl. VI, 1, 518; Pavlov, Fl. Tsentr. Kazakhst. III, 236; Krylov, Fl. Zap. Sib. XI, 2717; Majevski, Fl., Izd. 8, 575. —*B. platycephalus* Oerst. Ind. Sem. Hann. (1859) 27 and in Linnaea XXX (1859–1860) 753. —*B. cernua* β. *radiata* Ldb. Fl. Ross. II, 2 (1845–1846) 517. —*Coreopsis bidens* L. Sp. pl. (1753) 908. —**Exs.**: Estonian Plants, No. 25, a; Lindberg, Pl. Finl. exs. No. 973.

Annual. Stem erect (5)15–60(80) cm high, branched above or simple, glabrous or weakly pubescent. Leaves yellowish-green, three- to five-parted or dissected, with lanceolate or ovate-rhombic, serrate-toothed lobes, of which terminal lobe is considerably larger than laterals, glabrous or subglabrous, on more or less long petioles, sometimes entire, coarsely toothed to divided (f. *pseudocernua* Ganesch.). Capitula erect, 12–15(20) mm wide, wider than long (sometimes almost double). Outer involucral bracts (9)10–12(14), oblong-linear or lanceolate-linear, along margin spinulose, considerably (sometimes almost three times) longer than capitulum; inner bracts shorter, oval; pales narrowly linear, longer than achenes or equal (including awns). Florets tubular. Achenes cuneate, glabrous, compressed, with two awns as long as achenes or slightly shorter, sometimes awns four but then two of them longer than others. Flowering VI–IX.

Banks of rivers, oxbow lakes, marshes, reservoirs, in wet meadows, along wet ditches and pits. —*European Part*: All regions excluding the Far North; *Western Siberia*: Upper Tobol, Irtysh, Altai (up to 60° North latitude); *Eastern Siberia*: Angara-Sayans, Lena-Kolyma, Dauria; *Far East*: All regions; *Soviet Central Asia*: Aralo-Caspian, Balkhash Region, Tien Shan, Pamiro-Alai. *General distribution*: Scandinavia, central Europe, Atlantic Europe, Mongolia, Japan, China. Described from France. Type in Paris(?).

Note. Pavlov (l. c.), not without basis, mentions the "intermediate" character of this species, with leaves as in *B. tripartita*, but capitula like those of *B. cernua*. Generally, *B. radiata* is found sparsely within the range of the above two species, and all this leads to the idea of a hybrid origin for this species. It is also possible that the plants usually placed in *B. radiata* are simply hybrids *B. tripartita* × *B. cernua*, and they should not qualify as a species. Although Lindberg somehow distinguishes *B. radiata* from the indicated hybrids, as far as can be judged from the plants distributed by him in 1911 (Pl. Finl. Exs. No. 973 —*Bidens radiatus* Thuill. No. 974 —*Bidens radiatus* Thuill. × *B. tripartitus* L.). I could not determine just what differences Lindberg sees here.

559 5. **B. maximovicziana** Oett. in Tr. Bot. Sada Yur'evsk Univ. VI (1906) 216; Kom. and Alis. Opredel. Rast. Dalnevost. Kr. II, 1026. —*B. tripartita* β. *pinnatifida* Turcz. ex DC. Prodr. V (1836) 594 and in Fl. baic.-dahur. II, 1 (1856) 33. —**Ic.**: Oett. l. c., Plate III, Fig. 1.

Annual. Stem erect, simple or branched with obliquely upright branches, 30–50(80) cm high, glabrous or sparsely pubescent mainly above. Leaves petiolate, pinnatisect (sometimes three-lobed), with narrow and long, oblong to linear segments, lateral segments (one)two or three pairs, 2–3 to 7–8 cm long, terminal segment usually larger than laterals, serrate-toothed, with appressed spinules along margin. Capitula solitary or in twos or threes, terminal on stem and branches, compressed (wider than long, about 15 mm). Outer involucral bracts green, oblong, considerably exceeding capitulum, inner shorter, lanceolate, brownish-green, both (inner and outer) spinulose along margin; pales linear, membranous, equaling achenes (with awns). Ligulate florets absent; all florets tubular, yellow. Achenes cuneate, 4 mm long, laterally compressed, tuberculate along margin, erose and pubescent from comparatively long, dense, downward-directed, bristly hairs; awns two. Flowering VII–VIII.

Banks of rivers and reservoirs, oxbow lakes, wet depressions in meadows, on humus-rich, sandy soil. —*Eastern Siberia*: Dauria; *Far*

East: Zeya-Bureya, Ussuri, Sakhalin (Kuril Islands). *General distribution*: Japan, China. Described from the Argun River. Type in Leningrad.

6. **B. frondosa** L. Sp. pl. (1753) 832; Willd. Sp. pl. III, 1718; DC. Prodr. V, 594; Britton and Brown, Ill. Fl. North. Unit. Stat. III (1913) 495. — **Ic.**: Britton and Brown Ibid, p. 497. **Exs.**: A. Fiori and A. Beguinot. Fl. Ital. Exs. No. 1377.

Annual. Stem erect, glabrous or subglabrous, usually strongly branched, 50–75 cm high. Leaves thin, on rather long petioles, three-lobed; leaflets sharply serrate-toothed, lanceolate or oblong-lanceolate, central leaflet on 10–20 mm long petiole, lateral leaflets on much shorter petioles; sometimes terminal leaflet three-parted or three-divided, with larger central segment than laterals; uppermost leaves sometimes simple. Capitula semiglobose, (10)12–15 mm wide; outer involucral bracts four to eight, green, herbaceous, oblong-linear, with occasional spinules along margin, considerably longer than wide oblong-ovate inner bracts and often exceeding capitulum. Florets tubular, orange. Achenes cuneate, 5–7 mm long, compressed, laterally with one longitudinal rib in middle, covered throughout and along margin with appressed multicellular hairs, with two awns at apex, half as long as achene. Flowering VII–IX.

560 Gardens, vegetable gardens, near ditches, etc. *Far East*: Ussuri (known only from a district of Vladivostok). *General distribution*: North America, introduced in western Europe. Described from North America. Type in London.

Note. Linnaeus (l. c.) and a number of later workers noted the presence of the quite long, green, outer involucral bracts (whence is derived the name of the species) as the specific character of this species. Nevertheless, similar involucral bracts are found also in other species of the genus (e.g., *B. tripartita* L.). More characteristic of *B. frondosa* L. is the presence of hairs over the entire surface of achenes.

7. **B. parviflora** Willd. Enum. pl. horti Berolin. (1809) 848; DC. Prodr. V (1836) 603; Ldb. Fl. Ross. II, 2, 518; Turczaninov, Fl. baic.-dahur. II, 1, 35; Kom. Fl. Manchzh. III, 630; Kom. and Alis. Opredel. Rast. Dalnevost. Kr. II, 1026. —*B. messerschmidtii* Turcz. in DC. l. c. — *B. chinensis* DC. l. c. —*B. macrosperma* Fisch. Cat. Hort. Gorenk. (1808) 59. —*B. dahurica* Amman. Stirp. (1739) 148.

Annual. Stem erect, branched, (10)20–50(80) cm high, glabrous or with occasional scarcely visible hairs. Leaves many times (two to three) pinnatisect, with narrow, lanceolate or linear-lanceolate to linear toothed, pinnatifid segments on petioles, usually sparsely pubescent to subglabrous. Capitula solitary (or in twos or threes), terminal on stem and branches, long pedunculate, narrow, almost cylindrical; outer involucral bracts narrowly linear, green, herbaceous, finely pubescent, shorter than lanceolate-linear, gray-greenish inner bracts bearing occasional short bristles only along margin; pales linear, shorter than achenes. All florets tubular, yellow, few. Achenes linear, four-angled, more or less compressed, along ribs, covered with upward directed, lighter bristles, rest glabrous or puberulent, unequal hairs; inner achenes 15–20(25) mm long, outer shorter, with two erect, 4–5 mm long, awns at apex. Flowering VI–IX. (Plate XXXIII, Fig. 1).

On maritime and riverine precipices and rocks, sandy banks, outcrops of stones, sometimes as a weed near fences (made of stones), stony masonry works, etc. *Eastern Siberia*: Dauria; *Far East*: Ussuri, Zeya-Bureya. *General distribution*: Mongolia, Japan, China. Described from a specimen grown in Berlin. Type in Berlin(?).

Note. This species was first described by Amman (l. c.), who characterized it as follows: "Bidens dahurica saxatilis foliis Apii vel Cicuta magis, flore luteo nudo, semine Scandicis instar longissimo odorato. Messerschmidt, prope Dalailacum in Dahurica occurit".

Thus, although Amman gave a Latin diagnosis for his species, in conformity with the existing rules of nomenclature the Amman name for
561 this species (*B. dahurica*), as it was proposed in, pre-Linnaean time, had to be rejected, and Wildenow's epithet (*B. parviflora*) is being used.

8. **B. bipinnata** L. Sp. pl. (1753) 832; DC. Prodr. V, 603; Hoffm. in Pflanzenfam. IV, 5, 244; Britton and Brown, Ill. Fl. North. Unit. Stat. III (1913) 498; Hegi, Ill. Fl. VI, 1, 523; Grossh. Opredel. Rast. Kavk. (1949) 451. —**Ic.**: Hegi, op. cit. fig. 264. —**Exs.**: Dörifler, Herb. norm. No. 5091.

Annual. Stem 20–60 (and more) cm high, erect, usually branched above, angular and glabrous. Leaves thin, triangular-ovate, bipinnate or pinnate, with incised to parted and dissected leaflets, opposite, dark green, petiolate, glabrous or sparsely pubescent, leaflets (pinnae and pinnules) and their lobes ovate, acute, at base shortly cuneate or weakly cordate, terminal leaflet longer than laterals, three- to five-fid (to parted), lateral leaflets two or three pairs. Capitula on long, relatively slender peduncles, solitary; outer involucral bracts linear-lanceolate, somewhat shorter than inner linear ones; pales shorter than florets. Ligulate florets few (two to four), yellow, with ligules slightly exceeding involucre, linear, sometimes absent, and all florets in capitulum tubular, brown. Achenes dark brown, glabrous, linear, tetrahedral, about (8)10–12 mm long, very finely punctate, tuberculate, with stramineous, (two) three (four) awns at tip, shorter than achene itself, 4–5 mm long; outer achenes shorter and thicker than inner. Flowering VII–IX.

Weed along canals, riverbanks, gardens, etc. *Caucasus*: Western

Transcaucasia (known from the vicinity of the city of Sukhumi). *General distribution*: North America, introduced in Europe, northern Africa, South Asia. Described from North America. Type in London.

GENUS ***Cosmos** Cav.[1, 2]

Cav. Ic. et descr. pl. I (1791) 9. —*Cosmea* Willd. Sp. pl. III (1803) 2250

Capitula many-flowered on long glabrous peduncles; involucre almost globular, two-rowed, with 8–10 bracts in each row, at base more or less connate, acute. Receptacle flat, covered with membranous bracts, apically filiform. Ligulate florets sterile, large, purple, pink, white or golden yellow to orange; central (tubular) florets bisexual, yellow; style branches apically thickened and elongated (conically); anthers with cartilaginous, cordate apical appendages. Achenes more or less cylindrical 562 four- or five-angled, pillose, beaked and with two to four fragile awns at apex, with fine downward-directed bristles. Annual or perennial herbs with bipinnate leaves with narrow, linear to filiform, segments.

1. **C. bipinnatus** Cav. Ic. et descr. pl. I (1791) 9; DC. Prodr. V, 606; Hegi, Ill. Fl. VI, 1, 532; Katina in Vizn. Rosl. URSR (1950) 543; Fernald, Gray's Manual of Botany (1950) 1508; Pidotti, Opredel. Semyan Dekor. Rast. (1952) 90. —*Georgina bipinnata* Spreng. Syst. 3 (1825) 611. —**Ic.**: Hegi, op. cit. fig. 269; Pidotti, op. cit., Plate XXX, 1, 2.

Annual. Stem 80–125 cm high, glabrous like other parts. Leaves bipinnate with linear-filiform, thin segments. Outer involucral bracts ovate-lanceolate, usually with dark purple, longitudinal veins, acute, subulately attenuated; inner bracts oblong-ovate, subacute, glabrous, as also outer ones. Ligulate florets purple, pinkish-purple, red, or white, seven to nine, rather large (15–20 mm long and more), with three (five) blunt teeth at apex; tubular (disk) florets with five lanceolate teeth at apex. Achenes with a short beak and two or three awns or without, linear-cuneate, 7–12 mm long, 1.0–1.5 mm wide, somewhat recurved and more or less tetrahedral, with one longitudinal furrow on each side, spongy-scabrous, beak denticulate, brownish-yellow or grayish-brown. Flowering VII–X.

Grown as one of the most widespread ornamental plants. Described on the basis of cultivated specimens having originated from Mexico. Type in Madrid(?). *General distribution:* Comes from America; cultivated in all parts of the world.

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[1] Treatment by I.T. Vassilczenko.

[2] From the Greek word *cosmos*—decoration (the plant has beautiful flowers).

Note. Among the less widely distributed species of this genus in our country, we will mention: *C. sulphureus* Cav.—Sulfur-yellow Cosmos—with golden yellow or orange ligulate florets, broader segments of bipinnate leaves, long (up to 20–25 mm) achenes, and *C. diversifolius* Otto.—Heterophyllous Cosmos—usually with lilac ligulate florets, very narrow, black or dark gray, achenes (6–11 mm long, 0.6–0.8 mm wide), with two deep longitudinal furrows on each side and wide (lanceolate or oblong-ovate to ovate), acute leaf segments.

Subtribe 5. **GALINSOGINAE** O. Hoffm. in Pflanzenfam. IV, 5 (1889–1894) 245. —Capitula heterogamous or homogamous; peripheral florets pistillate, fertile, sometimes sterile; disk florets bisexual, fertile. Receptacle squamose. Pappus of different types, usually scaly.

563 GENUS 1512. **Galinsoga** Ruiz. and Pav. [1, 2]

Ruiz. and Pav. Fl. Per. Prodr. (1794) 110.—*Galinsogaea* Zucc. Flora (1821) 612.

Capitula many-flowered, small, semiglobose, terminal and axillary, in lax corymbs, pedunculate; involucre 1- (2-seriate, usually of five) oval or ovate, almost identical involucral bracts. Peripheral florets pistillate, ligulate, white, cream-colored, or pinkish, four or five; inner florets bisexual, tubular, yellow; anthers basally caudate. Receptacle conical, pales membranous, three-fid or fimbriate. Achenes obpyramidal or (outer) more or less compressed finely tomentose; pappus in central achenes of long ciliate scales and in outer achenes of short hairs.

Annual herbs with opposite leaves.

The species found in our country are known only as weeds introduced from America and are tending to expand their range.

1. Stem covered with scattered appressed hairs; leaves finely, remotely or bluntly toothed to sinuate..........1. **G. parviflora** Cav.
+ Stem with long, spreading hairs (particularly above); leaves coarsely serrate-toothed...........2. **G. quadriradiata** Ruiz and Pav.

1. **G. parviflora** Cav. Ic. et. Descr. pl. III (1794) 41; DC. Prodr. V, 677; Hoffm. in Pflanzenfam. IV, 5, 244; Schmalh. Fl. II, 58; Hegi, Ill. Fl. VI, 1, 524; Kom. and Alis. Opredel. Rast. Dalnevost. Kr. II, 1026; Grossh. Fl. Kavk. IV, 114; Sorn. Rast. SSSR, IV, 241; Vizn. Rosl. URSR, 533. —*Wiborgia parviflora* H.B. and K. Nov. Gen. et. Sp. IV (1820)

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[1] Treatment by I.T. Vassilczenko.
[2] Named after Martinez Galinsoga, Head of the Botanical Garden in Madrid.

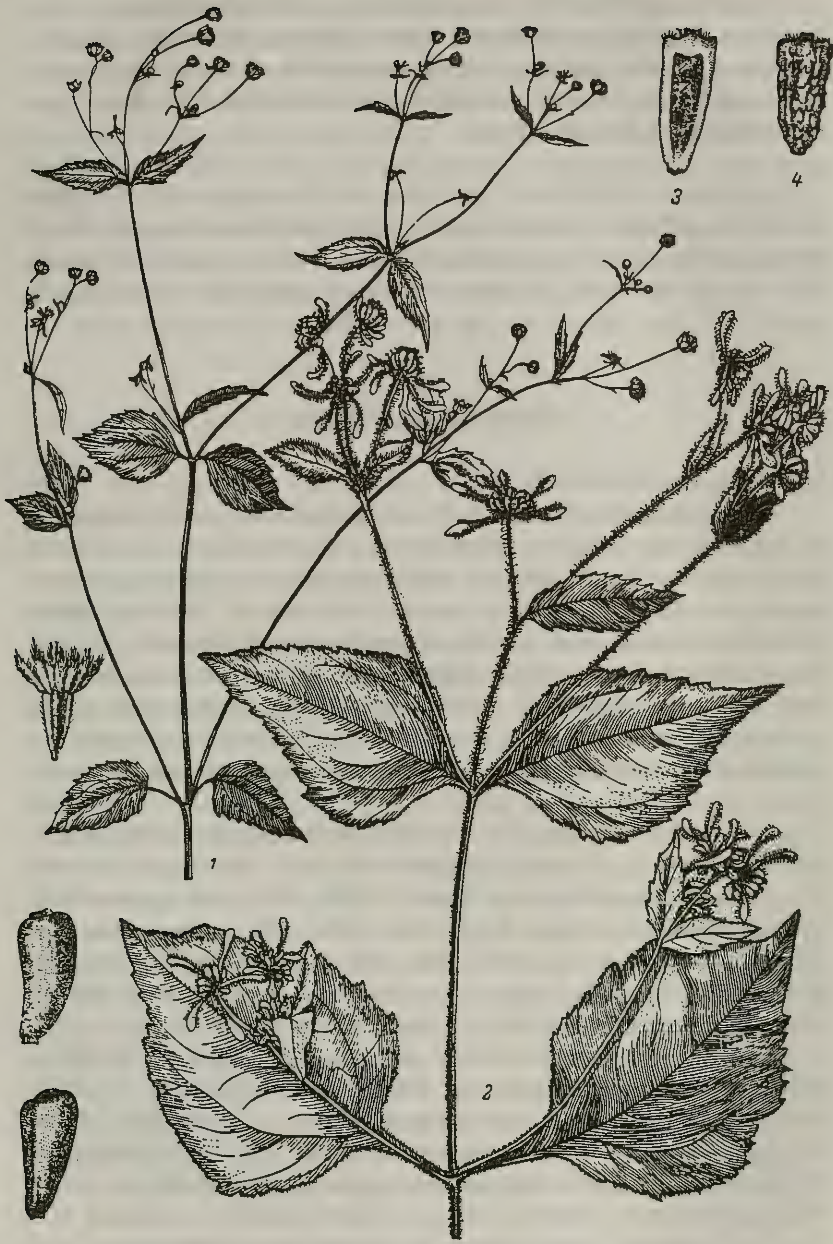
256. —*G. quinqueradiata* Ruiz and Pav. Syst. veg. fl. Peruv. (1798) 198. —**Ic.**: Hoffm. op. cit., fig. 120; Hegi, op. cit., fig. 265. —**Exs.**: GRF No. 2025; Woloszczak, Fl. pol. exs. No. 645; Fl. Exs. Reipubl. Bohem.-Sloven No. 78, 936; Fl. Exs. Austro-Hungar. No. 1784; Fl. Bohemiae et Morav. exs. No. 1976.

Annual. Plant sparsely covered with fine, simple appressed hairs,
more dense above, mixed with glandular hairs. Stem (10)20–60(100) cm
high, usually branched from base, with adventitious roots. Leaves ovate
or oblong-ovate, petiolate, finely and remotely or bluntly toothed or
sinuate. Capitula numerous on slender, unequal peduncles, in lax semi-
564 umbels, 3–5 mm wide (sometimes wider); ligulate florets about 3 mm long,
somewhat exceeding involucre; involucral bracts ovate, scarious along
margin. Achenes 1.0–1.5 mm long, finely light-pilose, outer achenes more
or less compressed, obtusely three-angled, inner ones four- or five-angled,
indistinctly tuberculate throughout, dark gray, sometimes almost black;
pappus of outer achenes of small fragile setae, of central achenes of
white, oblong-lanceolate, ciliate, (8)10–15(20) scales, basally connate
into annular rim and falling from it. Flowering VII to fall. Plate XXXIV,
Fig.1).

Weed in vegetable plots and gardens, around buildings and hedgerows, as well as in fields. *European Part:* Upper Dnieper, Baltic Region, Ladoga-Ilmen, Upper Volga, Volga-Don, Middle Dnieper, Upper Dniester, Black Sea Region, Lower Don; *Caucasus:* Ciscaucasia, Dagestan, western, southern and eastern(?) Transcaucasia; *Far East:* Ussuri. *General distribution:* From South America, introduced in all parts of the world. Described from Peru. Type in Madrid.

2. **G. quadriradiata** Ruiz and Pav. Syst. veg. fl. Peruv. (1798) 198; Hegi, Ill. Fl. VI, 1, 523; Szafer, Kulcz., Pawl. Rosl. polskie (1953) 679, —*G. parviflora* γ. *hispida* DC. Prodr. V (1836) 677, non *G. hispida* Benth. —**Ic.**: Hegi, op. cit., fig. 265. —**Exs.**: GRF No. 2026.

Annual. Stem 20–75 cm high, branched, pubescent particularly above with spreading white hairs about as long as stem diameter and with tiny sparse glands. Leaves ovate, at base abruptly cuneate or slightly sinuate, with occasional hairs and tiny glands; petioles shorter than lamina, along margin deeply (coarsely) serrate-toothed, 2–5 cm long. Capitula semiglobose, 4–5 mm wide, sometimes larger, in groups of few in semiumbels, on slender, spreading-pilose, unequal peduncles; involucral bracts broadly lanceolate, pilose; ligulate florets larger and broader than in former species (3–4 mm long). Achenes 1.5–1.8 mm long, narrowly cuneate, angular, dark gray to almost black, covered with appressed, upright hairs; pappus of narrow (linear) short ciliate scales, apically cleft, in outer florets half as long as achenes, in inner (disk) florets as long as achene or longer. Flowering VI–IX.



565 Plate XXXIV.

1—*Galinsoga parviflora* Cav. — Upper part of plant and achene; 2—*Siegesbeckia orientalis* L. —Upper part of plant and two achenes; 3—*Eclipta prostrata* L.—Achene; 4—*E. alba* (L.) Hauskn. —Achene.

Weed in gardens and vegetable plots, around hedgerows, etc. *European Part*: Middle Dnieper, Upper Dniester, Bessarabia, possibly introduced in other regions of the European Part. *General distribution*: North and South America, western Europe. Described from Peru. Type in herbarium of Ruiz and Pavon.

567 Subtribe 6. **MADINAE** O. Hoffm. in Pflanzenfam. IV, 5 (1889–1894) 248. —Capitula heterogamous, sometimes homogamous. Peripheral florets pistillate, fertile; disk florets bisexual, fertile or sterile. Receptacle with one or two rows of scales. Pappus in peripheral florets usually absent.

GENUS *Madia Mol.[1,2]

Mol. Sagg. Chile (1782) 136

Capitula terminal and axillary on short peduncles or sessile, in racemes or crowded into fascicles, often covered by bracteal leaves. Florets yellow; ligulate florets pistillate with three-toothed ligules slightly exceeding involucre; disk florets bisexual, five-toothed. Involucre almost globose, one-rowed; involucral bracts convolute, enclosing outer achenes. Receptacle glabrous or weakly convex with one row of pales enclosing inner achenes. Achenes four- or five-angled, cuneate, often more or less compressed; pappus absent or present. Annuals, hirsute (hairs simple and glandular) and simple leaves, lower leaves opposite, upper ones alternate.

1. **M. sativa** Mol. Sagg. Chile (1782) 136; DC. Prodr. V, 621; Hoffm. in Pflanzenfam. IV, 5 (1894) 249; Schmalh. Fl. II, 58; Hegi, Ill. Fl. VI, 532; Fernald, Gray's Manual of Botany (1950) 1510. —*M. capitata* Nutt. in Trans. Amer. Phil. Soc. n. s. VII (1841) 386. —*M. racemosa* Torr. and Gray, Fl. North. Amer. II (1886) 405. —*M. mellosa* Molina op. cit. 137; Willd. Sp. pl. III, 1051. —*M. viscosa* Cav. Ic. et descr. pl. III (1794) 50. —**Ic.**: Hoffm. op. cit. fig. 121, C; Hegi, op. cit., fig. 220, a.

Annual. Plant 30–100 cm high, pubescence of simple and glandular hairs, the latter more abundant in inflorescence. Stem erect, simple or branched, densely leafy. Leaves linear-lanceolate or linear-oblong to linear, entire, sessile, acute, semiamplexicaul; lower leaves usually opposite, sometimes middle leaves also opposite; upper leaves alternate but sometimes approximate. Capitula small, in short racemes or crowded into fascicles. Involucre almost globose; involucral bracts oblong-ovate, with

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[1] Treatment by I.T. Vassilczenko.

[2] From *madi*, the local Chilean name of the plant.

ridge (keel) on the back, boat-shaped, covered with abundant-stalked glands and simple hairs; pales ovate or broadly oval, folded like involucral bracts. Ligulate florets 5–12, cuneate or linear-oblong, in lower part pilose (like tubular florets). Achenes glabrous, straight or more often weakly 568 curved, outer ones compressed, before maturity black, later blackish-gray with brown or grayish-brown, random spots, 5–7 mm long. Flowering VII–VIII.

Cultivated sometimes in south for its oil-rich seeds. *General distribution*: Originates from South America; cultivated in various countries as a valuable oilseed plant. Described from Chile. Type in Madrid.

Note. Flowers of this plant close up under bright sun.

GENUS *Laya Hook. and Arn.[1,2]

Hook. and Arn. Bot. Beech. Voy. (1883) 357 nomen conservandum *Callichroa* Fisch. and Mey. in Ind. Sem. hort. Petrop. (1835) 31.

Capitula medium-sized, pedunculate; involucral bracts oblong, outer ones longer than the inner or almost as long. Ligulate florets 8–20, yellow or white, three-toothed at apex, pistillate; disk florets tubular, bisexual, five-toothed, yellow; achenes (outer) more or less enclosed by adjacent involucral bracts. Annual herbs with alternate, entire or pinnately divided leaves and branched stem.

1. **L. elegans** Torr. and Gr. Fl. North. Amer. II (1841–1843) 314; Hegi, Ill. Fl. VC, 1, 532; Bailey, L.H. Stand, Cyclop. of Horticult. (1922) 1832; Chittenden O.B.E. Dict. of Gard. (1952) 1139; Pidotti, Opredel. Semyan. Dekor. Rast. (1952) 95. —*Blepharipappus elegans* (Nutt.) Green in Pittonia II (1892) 246. —**Ic.**: Pidotti, op. cit., Plate XXII, Fig. 2.

Annual. Stem 20–50(75) cm high, densely branched, with long upright branches, sparsely pubescent, subglabrous below, more or less reddish, prostrate or ascending. Leaves undivided, linear-lanceolate or linear-oblong to linear, sessile, semiamplexicaul; lower leaves pinnately cut to divided, upper leaves entire or toothed; all leaves covered with long and short white hairs. Capitula 2.5–3.5 cm wide, solitary terminal on long peduncles; outer involucral bracts linear-lanceolate, densely covered with hairs and spinules, inner bracts shorter than outer; ligulate florets usually 10–12, golden-yellow, sometimes white-tipped. Achenes

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[1] Treatment by I.T. Vassilczenko.

[2] Named after Thomas Lay, an American naturalist of the last century. There is also another less used transcription of the name of this genus—*Layia*. [The latter orthography is the correct one according to the present International Code of Botanical Nomenclature (1994)—Scientific Editor.]

black, 3–4 mm long, about 1 mm wide, narrowly cuneate, densely setose with white upright hairs; pappus of one row of finely barbed bristles and (coming off lower part of bristles) numerous, shorter snow-white hairs. Flowering VII–IX.

569 Grown as an ornamental plant. *General distribution*: North America; cultivated in outer countries as an ornamental. Described from California. Type at Harvard University (USA).

Note. Besides this species, other species of *Laya* [*Layia*] are also found under cultivation from time to time. Chittenden (l. c.) distinguishes them in the following way.

1. Ligulate florets white......................**L. glandulosa** Hook. and Arn.
+ Ligulate florets yellow, often with white tips..............................2
2. Plant densely pubescent with simple hairs, often mixed with glandular hairs..3
+ Plants with only sparse, small, stiff hairs....................................4
3. Upper leaves entire..................................**L. elegans** Torr. and Gr.
+ Upper leaves pinnately divided (all or in part)...**L. platyglossa** (Fisch. and Mey.) Gray
4. Achenes usually pilose; pappus present...**L. calliglosa** (Fisch. and Mey.) Gray
+ Achenes glabrous; pappus absent...**L. douglasii** (Hook. and Arn.) Gray

Tribe 6. **HELENIEAE** Cass. in Dict. Sc. Nat. X (1818) 419, XX (1821) 346, XXXVIII (1825) 16, LV (1828) 263, LX (1830) 575, p. p.; O. Hoffm. in Pflanzenfam. IV, 5 (1889–1894) 251. —Tribe Helenioideae Benth. in Benth. and Hook. f. Gen. pl. II (1873) 199. —Capitula heterogamous or homogamous, usually with ligulate florets; receptacle without scales, glabrous, or sometimes alveolate; anthers at base usually entire or obtuse; style branches truncate or with appendages at apex; corolla usually yellow; leaves opposite or alternate.

Mainly annual or perennial herbs (sometimes semishrubs or shrubs), the overwhelming majority of which are found in the wild only in America.

See the Key to Genera on p. 478.

Subtribe 1. **TAGETININAE** O. Hoffm. in Pflanzenfam. IV, 5 (1889–1894) 263. —Involucral bracts one-rowed, usually equal, almost always sparsely glandular. Herbaceous plants, usually devoid of pubescence.

GENUS *Tagetes L.[1,2]

L. Sp. pl. (1753) 887

Capitula cylindrical or cup-shaped, usually solitary, rarely aggre- 570 gated into inflorescence. Involucre one-rowed, of five connate, coriaceous bracts covered with oblong and linear, sparse, translucent, flat glands. Receptacle flat, glabrous. Disk florets tubular, bisexual, golden-yellow, orange or brown; peripheral florets pistillate, ligulate, uniseriate (multiseriate in cultivated double forms), golden-yellow, light and dark orange or brown. Anthers bluntly rounded at base, style branches obtuse, in central florets long, twisted, in ray florets divergent. Achenes homogenous, linear or linear-oblong, tapering toward base, angular. Pappus of dissimilar and unequal scales, of which some connate and obtuse, others usually free, acuminate, aristate.

Annual herbs; stem erect, usually branched; leaves opposite or alternate, pinnately divided with occasional, translucent, round, brownish glands.

Of the 26 species distributed in America from Arizona to Argentina, 3 species were brought in or introduced into cultivation in our country.

Plants flowering profusely right up until late fall. Large- and small-flowered cultivars of marigold are distinguished.

1. Capitula small, cylindrical, five- to eight-flowered, usually aggregated in terminal corymbs; ligulate florets three, with dark orange or lemon-colored corollas. (1.2)2.5–3.0 mm long, their tubes covered with white hairs and ligules 1.2 mm long, 0.8 mm wide ....1. **T. minuta** L.

+ Capitula large, cup-shaped, many-flowered, solitary; ligulate florets five to seven or more, with yellow, orange or brown corollas, 1.1–2.0 cm long, the tubes usually glabrous and ligules 0.8–1.4 cm long, 0.7–1.2 cm wide..2

2. Stem branches divergent; leaves with linear-lanceolate lobes; peduncles below capitulum slightly thickened; involucre 1.5 cm long, 0.7 cm wide; ligulate florets with golden-yellow, orange, or brown corollas, their tubes slightly shorter than the pappuses and ligules 0.8 cm long, 0.7 cm wide, more or less round.................. ....2. **T. patula** L.

+ Stem branches upright; leaves with lanceolate lobes; peduncles below capitula clavate; involucre 1.8–2.0 cm long, 1 cm wide; ligulate florets with yellow or dark-orange corollas, their tubes almost equaling the pappuses, 1.4 cm long, 1.2 cm wide, obovate ....3. **T. erecta** L.

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[1] Treatment by S.G. Gorschkova.

[2] Named after the Etruscan deity Tages.

1. **T. minuta** L. Sp. pl. (1753) 887; Grossh. Fl. Kavk. IV, 115 and Opredel. Rast. Kavk. 451; Hoffm. Pflanzenfam. IV, 5, 265. —*T. glandulifera* Schrank, Pl. Rar. Hort. Acad. Monac. II (1819) tab. 54.

Annual. Plant 10–30 cm high, glabrous. Stem straight, branched; 571 branches opposite. Leaves alternate or opposite, pinnately divided (2)6–8 cm long, (0.8)3.0–4.5 cm wide, with 11–17 linear-lanceolate, 1.5–4.0 cm long and 1.5–4.0 mm wide, acute, serrate lobes. Capitula cylindrical, numerous, at tips of small branches, in dense, terminal, corymbose inflorescences. Small involucres of five, connate, involucral bracts, 0.8 cm long, 2–4 mm wide; involucral bracts apically round. Ligulate florets three, with dark-orange or lemon-colored corollas, 2.5–3.0 mm long, their tubes 1.8 mm long, glabrous, shorter than pappuses, ligules, obovate, 1.2 mm long, 0.8 mm wide, emarginate, glabrous; central (tubular) florets with orange-colored corollas 3 mm long, somewhat longer than pappuses, with 0.5 mm long teeth, smooth. Achenes linear 6.5–7.0 mm long, 0.5 mm wide, dark brown, covered with upright, appressed, white hairs; pappus of short scales, 0.3 mm long and much longer (1–2)2.3 mm long. Flowering VIII–X.

In low-lying and weedy places, as an introduction. *Caucasus*: Western Transcaucasia. *General distribution*: Central and South America. Described from Mexico. Type in London.

2. **T. patula** L. Sp. pl. (1753) 887; DC. Prodr. V, 643; Schmalh. Fl. II, 58; Grossh. Opredel. Rast. Kavk., 451; Klokov in Vizn. Rosl. URSR, 535. —**Ic.**: Kiselev, Tsvetovod., Fig. 108; Hegi, Ill. Fl. VI, 1, 534, fig. 271, h–t.

Annual. Plant (15)30–100 cm high, strongly aromatic, glabrous or pubescent. Stem erect, branched; branches divergent. Leaves pinnately divided, 2–9 cm long, 1.5–3.0 cm wide, with linear-lanceolate (1)2–7(8) mm long, (0.5)1.0 mm wide lobes, serrate, acute, often with 2–3(7) cm long, slender awns at apices. Capitula cup-shaped, usually solitary, on 5.0–6.5 cm long peduncles, weakly thickened below capitulum. Involucre 1.5 cm long, 0.7 cm wide, of five glabrous, connate bracts, with 1.5 mm long, 2.5 mm wide, free apices, acute. Ligulate florets exceeding involucre by a fourth, corollas 1.1 cm long, golden-yellow, orange, or brown with 3 mm long tubes and 8 mm long, 7 mm wide ligules, weakly emarginate, smooth; central florets tubular with yellow, smooth corollas, 6–7 mm long, usually as long as pappuses, five-toothed, 1.5 mm long. Achenes linear, tapered to base, 8 mm long, 0.5 mm wide, brown, covered with short upward-appressed, chestnut-colored hairs; pappus of short (0.4 cm long) and long (0.8–1.0 cm long) scales. Flowering VII–IX.

Propagated in gardens and parks as an ornamental plant everywhere except the Far North. Described from Chile. Type in London.

Note. T. patula is represented in cultivation by a large number of cultivars—yellow-flowered, mostly orange, and dark brown (Kichunov, *Tsvetovodstvo*, 1934, 25).

3. **T. erecta** L. Sp. pl. (1753) 887; DC. Prodr. V, 643; Hoffm. in Pflanzenfam. IV, 4, 265; Schmalh. Fl. II, 59; Grossh. Opredel. Rast. 572 Kavk. 451; Klokov in Vizn. Rosl. URSR, 536; Pidotti, Opredel. Semyan Dekor. Rast. (1952) 100. —**Ic.**: Kiselev, Tsvetovod., Fig. 108; Pidotti, op. cit., Plate XXX, 4.

Annual. Plant 50–150 cm high, strongly aromatic, glabrous. Stem erect, longitudinally finely ribbed, with upright branches. Leaves pinnately divided, 5–10 cm long, 4–8 cm wide, with lanceolate lobes, 0.8–3.0 cm long, 1.5–4.0 mm wide, sharply serrate, with 3–4 mm long awns (in upper leaves). Capitula solitary, cup-shaped; involucre 1.8–2.0 cm long, 1 cm wide, smooth, of five connate bracts, apices of bracts 2–3 mm long, 2 mm wide, acute. Ligulate florets 2.9 cm long, with yellow or dark orange corollas 2 cm long, tube 5 mm long, ligules obovate, 1.4 cm long, 1.2 cm wide, tapered to base, emarginate, smooth; tubular florets with yellow, smooth corollas, 9 mm long with five, 1.5–2.0 mm long teeth. Achenes linear, tapered at base, 8–11 mm long, 1 mm wide, black or brown, covered with short, chestnut-colored, upward-appressed hairs; pappus of short (0.6 cm long) and long (1 cm long) scales. Flowering VII–VIII.

Double forms are propagated in gardens and parks as ornamentals in all regions of the USSR except the Far North. Described from Mexico. Type in London.

Economic Importance. The leaves contain 98.3 mg% of vitamin C (Grossh. *Rast. Resursy Kavakaza* [Plant Resources of the Caucasus], 255).

573 ADDENDA XXIV[*]
DIAGNOSES PLANTARUM NOVARUM IN TOMO XXV FLORAE URSS COMMEMORATARUM

(Identification of New Species Included in Vol. XXV)

April, 1959

575 SOLIDAGO L.

1. **S. taurica** Juz. nov. spec. (*Virgaureae Pauciradiatae*).

Planta perennis, sat alta dense foliata caulibus valde firmis teretibus vel sulcatis, foliis numerosis (plerumque 20–30 in numero) imprimis in parte caulis superiore crebre dispositis, vulgo sine coloratione anthocyanica, relative minusculis ovatis vel lanceolatis acutis acute et tenuiter dentatis coriaceis; superiora quod magnitudinem sese valde aequantia, vulgo angusta, acuminata, saepius integerrima; omnia glabra et vulgo solum ad margines rigide pilosa. Inflorescentia multiflora, plerumque laxa, saepe ramosissima ramis lateralibus elongatis; ramuli inferiores pro more imperfecte evoluti; folia bractealia parum evoluta ramulis inflorescentiae multo breviora; capitula comparative parva involucrum 5–7 mm lg., 4-seriale squamis anguste lanceolatis acutis vel obtusiusculis, nervo mediano viridi, marginibus albescentibus; ligulae circa 3–5 mm lg. angustae; achenia usque ad apicem haud dense breviter pilosa.

Hab. in silvis (plerumque pinetis necnon silvis mixtis) et ad margines silvarum Tauriae.

Typus: In descensu e monte Ai-Petri, inter Pendikul et Utshan-Su, in pineto *P. Pallasianae*, ad viam 2 VIII 1946 S. Juzepczuk. Pl. tauricae n° 285.

Affinitas: *A. S. virgaurea* habitu peculiari, in cultura constantissime diversa.

2. **S. jailarum** Juz. nov. spec. (*Virgaureae Pauciradiatae*).

Planta perennis plerumque humilis sed robusta, caulibus 15–30 cm alt. haud raro rubentibus saepius bene foliatis, foliis tamen comparative paucis crebre dispositis (vulgo 10–15 in numero) dentibus etiam foliorum superiorum bene evolutis. Inflorescentia polycephala, compacta, dense conferta ramis vulgo valde abbreviatis—usque capitata: folia bractealia pro more bene evoluta; involucrum 4-seriale, squamis pallide viridibus margine late alboscariosis obtusis; ligulae magnae 6 □ 1.5 mm; achaenia circa 5 mm lg., usque ad apicem quamquam haud dense pilosa (inferne haud raro pilis solum solitariis praeditis).

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[*] Reproduced from the Russian original—General Editor.

Hab.: In margines silvarum in pratis et in declivibus jailarum Tauriae.

Typus: Reservatum Publicum Tauricum. In declivibus Jailae Babugan supra pratum silvaticum dictum «Bolshaja-Poljana», 1946 VII 23. S. Juzepczuk. Pl. taur. n° 214.

576 Affinitas: Praecedentis proles jailicola caule humiliore simplici, foliis majoribus sparsioribusque, capitulis dense congestis majusculis, ligulis magins (imprimis longioribus) diversa (quamquam formis intermediis cum *S. taurica* Juz. conjuncta).

3. **S. Gebleri** Juz. nov. spec. (*Virgaureae Pauciradiatae*).

Perennis, caule humili 10–25(40) cm alt., sat debili erecto vel paullo ascendente, plerumque flexuoso, levissime pubescente vel (inferne saltem) glabro; folia radicalia longissime, caulina plerumque sat longe alatim petiolata et solum caulina suprema pro more sessilia, plerumque obtusa vel caulina acutiuscula vel acuta, integerrima vel radicalia et caulina inferiora haud raro leviter dentata: caulina plerumque curvata, omnia plerumque glabra vel solum margine ciliata. Inflorescentia parum evoluta anguste racemosa vulgo conferta e capitulis haud numerosis (5–15) approximatis constans, eorum pedunculis brevibus rubescentibus; capitula majuscula, involucris eorum pauciseriatis, squamis acutis; laminis ligularum angustis; achenia suprene pilosa, inferne glabra.

Hab.: in tundris montanis Sibiriae altaicae.

Typus: In alpibus Korgonensibus et Ridderskensibus leg. Gebler; in Herb. Inst. Bot. Ac. Sc. URSS conservatur.

Affinitas: Affinis *S. dahuricae* Kitag., eorum prolem alpinam. *S. alpestri* Kit. analogam, representans.

4. **S. kuhiistanica** M. Pop. (in sched.) nov. sp. (*Virgaureae Pauciradiatae*).

Perennis, rhizomate robusto ramoso; caulis 20–50 cm alt. robustus, vulgo flexuosus, costatus, pallide viridis vel interdum paullo rubescens, glaber, superne subpubescenes, in inflorescentia pubescens; folia radicalia late elliptica vel fere rotundata, obtusa, glabra, in petiolum longum alatum subito angustata, grosse acute dentata, tenuia, glabra; folia caulina pauca, late elliptica vel late ovata, obtusa vel superiora acutiuscula, petiolis sensim abbreviatis alatis, suprema sessilia, omnia grosse obtusiuscule dentata, glabra vel solum margine ciliata. Inflorescentia generalis laxe racemosa, capitulis vulgo haud numerosis, haud longe pedunculatis, pedunculis leviter rubescentibus; capitula majuscula ca 12 mm lg.: involucrum ca 7 mm lg. 3-seriale squamis pallide viridibus obtusis glabris:

ligulae ca 7 mm lg., 2 mm lat.; achenia majuscula ca 5 mm lg. solum superne disperse pilosa, ceterum glabrescentia.

Habitat in alpinis et subalpinis montium Asiae mediae.

Typus: Montes Zeravschani superioris (Kuhistan), bass, fl. Fon versus N. a lac. Iskander, leg. Zakirov et Sergeeva 18 VII 1940; paratypus: lac Kara-kul, leg. M. Popov et Sergeeva, 20 VIII 1940. (in Herb. Inst. Bot. Ac. Sc. URSS conservantur).

5. **S. pacifica** Juz. nov. spec. (*Virgaureae Pauciradiatae*).

Perennis, radicibus fibrosis; caulis 20–60 cm alt. gracilis, erectus, strictus vel flexuosus, simplex, sulcatus, glaber, laxe foliatus; folia alatim 577 petiolata, oblonga vel lanceolata acutata, irregulariter tenuiter serrata, superiora sicut folia floralia vulgo integerrima, glabra vel breviter pubescentia (praesertim ad margines). Inflorescentia generalis ambitu cylindracea plerumque longa et angusta, interrupta, e ramulis brevibus, dense breviter pubescentibus saepe polycephalis compactis constans rarius sese valde approximatis et in racemum singulum compactum confluentibus; bracteae parvae, lanceolatae, capitula minuscula ca. 7–12 mm lg.; involucra (3)4-seriata 4–6 mm lg., haud densa, squamis eorum membranaceis pallidis, in medio anguste viridi-striatis, obtusissimis (apice fere rotundatis); ligulae ca. 5 mm lg.; achenia parva ca. 2 mm lg., glaberrima.

Habitat in silvis frondosis acerosis et mixtis necnon in fruticetis Orientis Extremi.

Typus: Oriens Extremus, Distr. Vladivostok, reg. Suifunensis, in vicin. opp. Nikolsk-Ussuriensis, Krasnojarskaja sopka (ad fl. Suifun) 5 IX 1927 leg. W. Tranzschel sub n° 534.

Affinitas. Ab *S. spiraeifolia* Fisch., quocum confunditur, bene dofert ramulis inflorescentiae abbreviatis compactis.

6. **S. kurilensis** Juz. nov. spec. (*Virgaureae Pauciradiatae*).

Perennis, mediocris vel elata caule 15–50 cm alt. erecto flexuoso, glabrescente et solum superne breviter piloso, crebre foliato; folia late lanceolata apice longe et tenuiter acutata basi sensim in petiolum longum anguste alatum attenuata, suprema subsessilia, tota longitudine tenuiter serrata, parce breviter pilosa. Inflorescentia polycephala dense congesta ambitu obconica e ramulis pluricephalis compactis constans; capitula comparative parva ca. 5 mm lg., sessilia, squamae involucri angustae acutiusculae; ovaria glabra, achenia matura adhuc ignota.

Habitat in declivibus montium et in pratulis insularum Kurilensium.

Typus: Insulae Kurilenses Meridionales, ins. Sikotan 27 VIII 1948 leg. A. I. Gizenko; in Herb. Inst. bot. Ac. Sc. URSS conservatur.

Affinitas: Inflorescentiae indole, capitulis subminoribus et squamarum involucri forma a proxima *S. ussuriensi* diversa.

7. **S. cuprea** Juz. nov. spec. (*Virgaureae Pauciradiatae*).

Herba perennis, humilis, 17-18 cm alt.; caulis erectus, strictus, sulcatus, in parte inferiore glaber, versus apicen dense pubescens, pilis longiusculis, rigidis, curvatis, parum foliatus, foliis difformibus; radicalia et caulina inferiora late ovata vel elliptica apice acutata, basi rotundata, truncata vel subito angustata, grosse dentata dentibus oblique deltoideis longe acuminatis margine exteriore sigmoideis, petiolo late alato, caulina superiora late lanceolata, longe acutata basi sensim cuneatim angustata, serrata. Inflorescentia oligocephala laxa, capitula ca 1 cm lg., 1–3 in axibus foliorum caulinorum superiorum, longe pedunculata; involucra ca 5 mm lg., phyllis eorum ovato lanceolatis acutis; achenia glabra.

578 Habitat in pratis insularum Comandorensium.

Typus: ins. Cuprea («Medny»), pag. Preobrazhenskoe, leg. A. Kardakov 13 VIII 1930; in Herb. Inst. Bot. Ac. Sc. URSS conservatur.

Affinitas. A proxima *S. spiraeifolia* Fisch. foliorum forma et pubescentia caulis statim differt.

HETEROPAPPUS LESS.

8. **H. elisabethinus** Tamamsch. sp. nova.

Biennis; caulis 25–30 cm altus, solitarius, in diametro 1–1.3 cm, glaber vel vix pilosus, fere e basi aequaliter pedunculifer, plus minusve costatus et dense foliosus; folia inferiora 9–10 cm longa 16–17 mm lata oblongo-lanceolata, integerrima, venis marginibusque pilosiuscula. Calathidia terminalia, 5 cm in diametro; involucri phylla herbacea, externa linearilanceolata, 0.7–0.8 cm longa, subglabra, interna colorata, breviter pilosa, apice attenuata subuliformia saepe adunca, externis duplo longiora; ligulae coeruleolilacinae, 2.5 cm longae; receptaculum foveolatum, achenia anguste obovata, pilis appressis tecta, pappus homomorphus, setis rubescenti-brunneis.

Typus: Oriens extremus. Insula Sachalin, in promontorio Elisabethino 30 VIII 1951 leg. A. I. Tolmaczev.

Affinitas. Nostra species nova affinis est *H. hispido* (Thunb.) Less. sed pappo homomorpho statim dignoscitur. Ab *H. saxomarino* Kom. differt caule aequaliter folioso, pedunculis a basi ad apicem caulis dispositis et calathidiis majoribus.

9. **H. noneifolius** Tamamsch. sp. nova.

Biennis; planta 15–18 cm alta, caulis solitarius a basi ramosus, pilis albis densis longis patulis tectus; folia inferiora 2–3, oblongo elliptica basi in petiolum alatum attenuata, 6 cm lg et 1 cm lata, marginibus inferne rotundato dentata, dentibus ab utroque latere 2–3, pilis longis patulis praesertim ad venas comitata; folia media anguste lanceolata integerrima, ob pilos rigidos annpressos asperula, marginibus ciliata, 3–3.5 cm longa et 0.5 cm lata. Calathidia solitaria terminalia, involucri phylla angusta, dense albo-pilosa, acuminata, pili ad venam mediam et praesertim ad margines 1–1.5 mm longi; ligulae 1.2–1.5 cm longae, roseo syringeae; achenia obovata pilis appressis tecta; pappus homomorphus.

Typus: Oriens extremus, ditio Terkei sinus Malaja 22 IX 1935 n° 1337, leg. B. Kolesnikov.

Affinitas. Appropinquat ad *H. medium* (Kryl.) Tamamsch. sed glandulis parvis aureis deficientibus bene differt.

ASTER L.

10. **A. Korshinskyi** Tamamsch. sp. n. —*A. alpinus* var. *dahuricus* Lindl. in Onno. Bibl. bot. H. 106 (1932) 47. —*A. alpinus* ssp. *Vierhapperi* Onno l. c. pro min. p.

579 Perennis. rhizoma ascendens, ramosum, in parte superiore foliis siccis obtectum; caules 20–36 cm alti, firmi ascendentes vel erecti, singuli vel pauci, angulares, tenuiter sulcati, in parte inferiore et sub calathidio dense pubescentes, pilis tenuibus patentibus, inaequalibus, griseis; folia infima congesta majuscula, cum petiolo 12 cm longa horizontaliter patentia, nunquam sursum vergentia, petioli laminae subaequales vel paulo breviores, in parte inferiore caulis anguste alati: lamina 2–7 cm lg., 1.5–2 cm lata, marginibus ciliata in superficie pilis appressis brevissimis tecta. apud folia infima subrotunda, apud cetera elliptica, venis 3–5, subtus bene distinctis; folia media diminuta, vulgo lanceolata, rarius linearia, sessilia, magis pubescentia. Calathidia cum ligulis 4.5–5 cm in diametro, involucrum hemisphaericum; phylla involucri viridia, interna in parte superiore subacuminata 1 cm lg., 2 mm lata, vix puberula, marginibus, imprimis in parte inferiore, longe ciliata, flosculis disci luteis tubulosis paulo breviora; ligulae roseosyringeae, venis 4, 1.8–2.2 cm lg., 3–4 mm lata, setae pappi albae, non numerosae, subinaequales, longissimae, flosculis disci aequales vel vix longiores; achenia pappo subtriplo longiora, obovata, hepatica, pilis appressis sursum vergentibus tecta.

Typus: Prov. Sverdlov. Prope opp. Krasnoufimsk, in saxosis ad «Sokolov Kamenj». 3 VII 1886 S. Korshinsky.

Nostra species affinis est *A. alpino* L., sed pilis adpressis (nec patentibus), ligulis brevioribus sat differt.

11. **A. suputinicus** Tamamsch. sp. nova.

Planta perennis; rhizoma incrassatum, 1 cm in diam., horisontale; caulis circa 30 cm altus, tenuis, erectus inferne rubescenti-brunneus, glabratus superne griseus et adpressim hirsutus. Folia radicalia sub anthesi non emarcida magnitudine varia, minora usque ad 1 cm lg., majora 6 cm lg. 3 cm lt., late ovata vel subrotundata margine crenata remote obtuse serrata et denseciliata supra obscure viridia utrinque scabrida, margine remote dentata vel integra, breviter petiolata, folia superiora minora lanceolata sessilia. Calathidia 1–1.5 cm diam. in corymbum disposita; pedunculi tenues, folia minima gerentes; involucrum late-campanulatum involucri phylla 3–4-serialia imbricata, apice plus minus scariosa; ligulae roseae involucro duplo longiores; achenia matura ignota, immatura valde hirsuta.

Typus: Oriens extremus. Prope stationem viae ferreae Okeanskaja in agris derelicits 28 VIII 1925 leg. Kenskaja.

Affinitas. Nostra species nova affinis est *A. ageratoidi* Turcz. sed foliis radicalibus et infimis caulinis diu persuistentibus nec tempore florendi deficientibus distinguitur.

12. **A. luxurifolius** Tamamsch. sp. nova.

Perennis; rhizoma dense radicibus tenuibus tectum; caulis vulgo solitarius, raro 2, ca. 1 m alti, roseo violacei vel sordide albi, vix costati, subglabri vel pilis glandulosis raris tecti, folia radicalia tempore florendi marcescentia, folia media ovata, subcoriacea 17–18 cm longa, 5–6.5 cm 580 lata, breviter petiolata, petioli 5 mm longi, marginibus serrato-dentata, folia superiora minora. Calathidia in corymbum aggregata; involucrum post floritionem late campanulatum, phylla involucri 3-serialia laxiuscula; receptaculum planum alveolato-foveolatum, ligulae subviolaceae 2–3-dentatae, achenia pubescentia, pappus rufescens.

Typus: Oriens extremus. Dit. Czernigovka prope pag. Svetlojarovka in fruticetis 24 IX 1929 leg. J. V. Kusnetzov.

Affinis est, ut videtur, *A. pensauensi* Tamamsch. sed foliis mediis 17–18 cm longis, 5–6.5 cm latis (nec 10 cm longis, 3 cm latis) diversa est.

13. **A. pensauensis** Tamamsch. sp. nova.

Perennis; caulis in parte superiore ramosissimus, tenuiter sulcatus, glaber; folia radicalia incognita, falia caulina media, 10 cm longa, 3 cm lata, lanceolata, marginibus non profunde et inaequaliter dentata, asperula, folia superiora et ramealia minora. Calathidia corymbum formantia; involucri phylla laxiuscula 2–3 serialia, 1–2.5 mm longa, interna longiora, linearia, duplo vel triplo extimis longiora; receptaculum subplanum, alveolato-foveatum, ligulae lucido-syringeae vel subalbae; achenia appressim pilosa.

Typus. Oriens extremus, systema fluminis Suczan, prope pagum Frolovka in valle fl. Pensau 3 VII 1913 leg. A. Bulavkina.

Affinitas. Valde affinis *A. see-burejensi* Tamamsch., sed ligulis lucido-syringeis (nec violaceis), calathidiis numerosis (nec tantum 10), foliis petiolo brevi non alato munitis (nec petiolis longis alatis).

14. **A. fallax** Tamamsch. sp. nova.

Perennis; rhizoma longum repens; caulis 25–30 altus, pilis longis crispatis perplexis praesertim sub calathidiis tectus, purpurascens vel brunneo-purpurascens; folia radicalia rosulata, integra, spathulata, vel lanceolata, viridia vel purpurascentia, glabra vel glandulis minimis dispersis munita, marginibus ciliata, petiolis laminam subaequantibus, folia caulina lanceolata, sessilia. Calathidia majuscula, involucrum hemisphaericum, phylla involucri lanceolata herbacea vel albo-marginata, 1 cm longa et 2–3 mm lata, purpurascentia; phylla involucri externa dorso in vena media pilis longis densis undulatis tecta, aeque marginibus; phylla involucri interna dorso glabra; ligulae purpureo-violaceae 2–2.5 cm longae.

Typus. Krasnojarsk 1838, leg. N. Truczaninov.

Affinitas. Nostra species nova affinis est *A. alpino* L., sed statura altiore, 25–30 cm alta (nec 15–25 cm) caule purpureo-colorato (nec. viridi), ligulis violaceis (nec roseolis vel coerulescentibus) sat differt.

KEMULARIELLA TAMAMSCH. gen. n.

Calimoris. -DC. Prodr. V (1836) 259 p. p. —*Diplopappus* DC. l. c. 275 p. p. —Ldb. Fl. ross. II (1844–46) 484 p. p. —*Aster* Sect. *Calimeris* Benth. et Hook. Gen. II (1873) 274 p. p. —*Aster* Sect *Caucasica* Kem.-Nat. Tr. Tifl. Bot. Inst. 1 (1934) 98.

581 Calathidia heterogama, hererochroma vulgo solitaria in apice pedunculorum; phylla involucrii laxe imbicata, angusta, acuta, herbacea, appendicibus nullis. Receptaculum convexum, conicum vel hermisaericum, alveolatum, marginibus alveolarum anguste membranaceis. Flosli disci hermaphroditi, corollae tubulosae, luteae; flosculi marginales pistillati, ligulati, numerosi, corollae purpureae, roseae, lucido-roseae vel fere albae, ligulae pappo valde longiores. Antherae basi obtusatae appendice lanceolata praeditae; rami styli apud flosculos hermaphroditos appendice lata triangulari-ovata apud pistillatos angustiore interdum ovali muniti. Achenia oblonga a dorso plus minusve compressa costis tribus tenuibus, pilis appressis rigidis dense pubescentia; pappus biserialis, series externa multo brevior palaeacea, series interna e setis subaequalibus longis tenuibus scabris sistens.

Species 6 Caucaso propriae.

Typus generis: *K. caucasica* (Willd.) Tamamsch.

A proximo genera *Aster* L. pappo duplico statim dignoscitur.

15. **K. Albovii** Tamamsch. sp. nova.

Suffruticulus humilis, 25–30 cm longus; rhizoma longum, repens; caules numerosi tenues, rubescentes, breviter pubescentes, dense foliosi; folia 2.5–4.5 cm longa et 1–2 cm lata, lamina late elliptica, apice mucronata, basi brevissime petiolata, utroque latere breviter pilosa. Pedunculi tenues, pilis brevibus tecti, calathidia solitaria; involucrum campanulatum, phylla involucri biserialia subhomomorpha, pubescentia; flosculi disci hermaphroditi, tubulosi, flavi; ligulae pistillate, roseolae vel albulae involucro duplo longiores; achenia hirsuta.

Typus: Jugum Megrelicum, planities elata Aschi, in rupium calcarearum fissuris 6 VIII 1947 A. Kolakowsky.

Affinitas. Valde affinis *K. colchicae* (Alb.) Tamamsch. foliis ellipticis (nec late lanceolatis), subintegris (nec dentibus glandulosis paucis instructis), phyllis involucri dense pubescentibus (nec glabris), ligulis subalbis (nec roseis) distinguitur.

ASTEROTHAMNUS NOVOPOKR.

16. **A. Schischkinii** Tamamsch. sp. nov.

Suffrutex ad 20–25 cm alt., ramosissimus. Caules numerosi tenues, basi griseo-brunnei in parte midia obscuro-straminei, apice griseo-virescentes vix tomentosi, dense foliosi. Folia 10–15 cm lg. 1--1.3 cm lt., linearia uninervia marginibus valde revoluta, apice acuta, folia suprema gradatim diminuta supra et subtus dense perplexe villosa. Calathidia parva 1–1.5 cm in diam., corymbosa, apice ramulorum solitaria, eligulata (discoidea); pedunculi griseo-villosi. Involucrum imbricatum, involucri phylla triserialia, villosa deltoidea acuta, uninervia nervo medio purpurascente vel rubescente, margine apiceque purpurascente. Flores omnes eligulati, involucrum subaequantes, hermaphroditi tubulosi omnes 582 pallide rosei, vel violacei, vel purpurascentes vel raro pallescentes. Corollae tubus pilosiusculus. Achenia non dense pilosa, brunnea, pappus albus floribus aequilongus, setae vix scabriusculae.

Typus. Asia Media. Montes Tjanj-Schanj, in clivis lapidosis ad ripam fl. Kaindy, 1912, leg. B. Schischkin.

Affinitas. *A. fruticoso* valde similis sed involucri phyllis apice purpurascentibus vel rubescentibus, (nec albis vel viridulis) ligulis deficientibus (nec praesentibus), flosculis disci luteis (nec purpureis).

GALATELLA CASS.

17. **G. altaica** Tzvel. sp. n. (Sect. *Galatella* ser. *Hamisphaericae* Novopokr.).

Plants perennis, 20–50 cm alta, brevissime, sed dense puberula, leviter scabra, caulibus solitariis vel paucis, erectis, sed basi saepe ascendentibus, apice ramosis, ramulis paucis capitula 1–2 gerentibus, foliis oblongolanceolatis vel lineari-lanceolatis ad 6 cm longis et 12 mm latis, sessilibus, basi sensim angustatis, apice breviter acutatis, trinerviis (nervis lateralibus interdum vix prominentibus), utrinque, rarius supra punctatis, viridibus (non laete), supremis minutis bracteiformibus. Capitula vulgo pauca, in corymbum disposita, sat magna, 25–50-flora, disco 10–14 mm longo et 13–20 mm lato (statu compresso), involucro subhemisphaerico, 4–5 mm longo et 7–10 mm lato, involucri phyllis dorso puberulis, rarius subglabris, margine brevissime arachnoideo-fimbriatis, trinerviis, rarius partim uninerviis, exterioribus ovato-lanceolatis, acutis, virescentibus, intimis multo majoribus et magis lucidis, oblongis, apice obtusis vel acutiusculis, marginibus anguste membranaceis, floribus disci numerosis, pallide-flavis interdum partim roseo violaceis, floribus radii ligulatis, roseo-violaceis. Achenia 3.5–4.5 mm longa, semiadpresse pilosa, pappo 6–7 mm longo, albido VII–IX.

Habitat: in steppis montanis et fruticetis, ad margines silvarum praesertim in regione montana media.

Area geographica: Altai austro-orientalis (systema flumini-Czuja).

Typus: Altai, distr. Kosch-Agacz, steppa Czujskaja, in fauce Kzyl-Czin, 1 VII 1937, A. V. Kalinina; in herb. Inst. Bot. Ac. Sc. URSS conservatur.

Affinitas: Haec species speciebus *G. macrosciadia*, *G. dahurica* et *G. chromopappus* affinis est, sed a prima foliis breviter acuminatis, capitulis majoribus et statura humiliore, a secunda pubescentia densiore et foliis brevites acuminatis, a tertia pappo albido (non dilute roseo-violaceo), involucris 4–5 mm longis et 7–10 mm latis (non 5–7 mm longis et 9–12 mm latis), subhemisphaericis differt.

583 CONYZANTHUS TAMAMSCH gen. nov.

Conyza Spreng. Syst. veg. III 3 (1826) 515, p. p. —*Tripolium* (*Astropolium*) Nutt. in Trans. Amer. Phil. Soc. n. s. VII (1841) 161 p. p. —*Aster* (*Tripoliopsis*) Novopokr. in Dokl. Akad. Nauk Az. SSR III, 12 (1947) 547 p. p.

Calathidia parvula, tantum usque ad 1.5 cm lg., homochroma, heterogama, inflorescentiam paniculatam vel racemosam formantia; involucrum imbricatum, angustum, tri-quadriseriale; folia suprema parva, sensim in squamas involucri transeuntia, squamae involucri lanceolatae apice acuminatae, rubidae, in parte media incrassate stramineo-flavae post anthesin siccae, rigidae, intimae oblongae vel lineares, flosculis marginalibus longiores vel eis aequales. Receptaculum planum alveolato-foveatum et hink anguste membranaceum, in angulis inaequaliter dentatum. Flosculi disci non numerosi (4–7), anguste tubulosi, breviter denticulati hermaphroditi; styli rami angusti pilis rectis brevibus tecti, dentibus corolla vix longioribus. Antherae flosculorum tubulosorum in filamentis glabris geniculatim flexuosis superne vix incrassatis insidentes, base vix obliquae; acuminatae; appendices apicales breves conicae; flosculi marginales (21–24) interdum subfiliformes, vulgo anguste tubulosi, ligulis brevissimis ramis styli aequalibus vel sublongioribus, limbus 2–3-lobus, coralla rosea, caerulescens vel pallide violacea; omnia achenia aequalia, angustissima, quadrangula, basi annulo evidente munita, pappus uniserialis, pilis aequalibus, tenuibus, non multis, fragilibus, albis interdum rufescentibus, achenio sesqui longioribus.

Species 3–4 Americae australi propriae.

Typus generis: *C. graminifolius* (Spreng.) Tamamsch.

A proximo genere *Aster* L. flosculis marginalibus in cyclos aliquot dispositis (nec cyclo unico vel sesqui), pappo alieno, phyllis involucri alteris et notis aliis bene differt.

ERIGERON L.

18. **E. plurifolius** Botsch. sp. n.

Perennis. Rhizoma breve; caules 1–2, simplices, foliiferi, monocephali, erecti, 15–25 cm alti, basi circa 2 mm in diam., pilis sparsis patentibus sat longiusculis multicellularibus et glandulis pedicellatis pluribus vestiti. Folia integerrima marginibus ciliato-pubescentia pilis sat longiusculis patentibus erectis obsitis; laminae supra et subtus glandulis pedicellatis ornatae; basalia petiolata pauca oblanceolata apice obtusiuscula, 1.5–5.5 cm longa et 2–5 mm lata; caulina numerosa (15–20); caulina inferiora et media sessilia lineari-spathulata apice obtusata, 2–5 cm lg. et 2–4 mm lata; caulina superiora lineari-lanceolata, acuta, 1–2 cm lg. et 1–1.5 mm lata. Capitula 1–1.1 cm lg. et 2–2.5 cm lata: involucri phylla rubescentia, lineari-lanceolata longe acuminata appressa subaequalia, 7–8 mm lg. et 0.8–1.2 mm lt., pilis sparsis rigidiusculis erectis patentibus non longiusculis ecoloratis vestita. Flosculi radii feminei ligulati circa 7.5 mm lg.; ligulae roseae ca. 4.5 lg. et 0.3 mm lt. in sicco tubuliformes; flosculorum tubus

in parte superiore pubescens pilis brevibus sparsis. Flosculi disci flavi,
584 tubulosi, conici, quinquedentati, ca. 4 mm lg.; eorum tubus in parte
superiore pubescens. Pappi setae numerosae (ca. 25) scabridae, ecoloratae,
ca. 5 mm lg. Achenia immatura dense pubescentia pilis rigidiusculis
subappressis.

Habitat in tundris fruticulosis Sibiriae Arcticae et peninsulae Czukotka.

Typus. Peninsula Czukotka, flamen Malyi Czaun (Малый Чаун) 9. VII. 1938. fl., K. Jakovlev. In Herb. Inst. bot. Ac. Sc. URSS (Leningrad) conservatur.

Ab *E. eriocalyx* (Ldb.) Vierh. pubescentia glindulifera totius plantae, foliorum numero, flosculis disci anguste conicis differt.

19. **E. trimorphopsis** Botsch. sp. n.

Perennis. Rhizoma breve ramosum. Caules pauci, erecti, foliosi, virides, 12–35 cm alt. et 1–2 mm in diam., nunc simplices monocephali, nunc ramosi 2–3-cephali, ramis elongatis, pubescentibus pilis aut rigidiusculis longiusculis multicellularibus patentibus aut brevibus appressis interdum praecipue sub capitulo glandulis pedicellatis intermixtis. Folia viridia, integerrima marginibus ciliata vel interdum supra et subtus pilis rigidiusculis longiusculis multicellularibus patentibus instructa; basalia longe petiolata, oblanceolata obtusata vel acuminata, 2.5–12 cm lg. et 4–13 mm lt.; caulina 0.5–9 cm lg. et 1–10 mm lt., caulina inferiora basalibus similia; superiora lanceolata, acuta, sessilia. Capitula 0.9–1.3 cm lg. et 1.5–2.5 cm lt.; involucri phylla viridia, lineari-lanceolata, acuta, disco breviora; interiora 5–7 mm lg. et 0.7–1 mm lata, exteriora interioribus subduplo breviora. Flosculi radii feminei ligulati 5.2–8.2 mm lg. (tubo 2.4–3.1 mm lg.), flosculorum tubi in parte superiore pubescentes, pilis brevibus sparsis appressis; ligulae roseae ca. 0.5 mm lt. secundum longitudinem in tubo convolutae. Flosculi disci 4–4.5 mm lg., hermaphroditi tubolosi cylindracei in parte inferiore in tubo cylindraceo abrupte angustati quinquedentati, dentibus roseis in parte superiore pubescentibus; pappi setae biseriales, exteriores brevissimae, interiores 3.9–5.5 mm lg. Achenia oblonga-lanceolata, compressa, 2.5–2.7 mm lg., pilis rigidiusculis subadpressis vestita.

Habitat in pratis alpinis (ad alt. usque 2800 m s. m.) montium Asiae Mediae.

Typus. Montes Hissar. Systema fluminis Kaphirnigan superior, flumen Tuvisch. 20 VIII 1937. n° 283, fl. et fr., N. Gontscharov et V. Michajlovskji. In Herb. Inst. Bot. Acad. Sc. URSS (Leningrad) conservatur.

Ab *E. petiolari* Vierh. caule ramoso, involucri squamis disco brevioribus. flosculis disci cylindriceis differt.

20. **E. baicalensis** Botsch. sp. n.

Biennis. Caules solitarii vel pauci, erecti, in parte superiore ramosi, foliosi, rubescentes, 10–42 cm lg., 1–4 mm in diam., pilis sparsis rigidiusculis longiusculis multicellularibus patentibus et pilis minutissimis adpressis obsiti; intedum pili longiusuli desunt. Folia viridia vel rubescentia, integerrima, aut supra et subtus pilis sparsis rigidiusculis 585 multicellularibus patentibus ornata aut ad marginem ciliata; basalia ad anthesin plerumque emarcida, oblanceolata, acuminata vel obtusata, 3–17 cm lg. et 3–13 mm lt., caulina numerosa dense disposita caule subobvallata, 0.5–11 cm lg. et 0.6–15 mm lt., inferiora caulina basalibus similia, superiora lanceolata, acuta, sessilia. Inflorescentia compacta subcorymbosa; capitula pauca, 7–12 mm lg. et 14–25 mm lt. Involucri phylla disco breviora, lineari-lanceolata, acuta, rubescentia vel viridia, pilis rigidiusculis longiusculis patentibus instructa; interiora 6–8 mm lg. et 0.6–0.7 mm lt., exteriora dimidio breviora. Flosculi radii feminei dimorphi: exteriores ligulati 6–7.6 mm lg., flosculorum tubi 3–4 mm lg. in parte superiore pubescentes pilis brevibus adpressis, ligulae pallide lilacinae, ca. 4 mm lt., interiores tubulosi, 2.5–2.8 mm lg., ecolorati, in parte superiore pilis breviobus adpressis instructi; stylus tubum 1.2–2.5 mm superans. Flosculi disci hermaphroditi, flavi tubulosi, quinquedentati, 4.5–5 mm lg., in parte superiore pubescentes. Pappus biserialis, setae exteriores brevissimae, interiores 6.7–7.5 mm lg. Achenia oblongo-lanceolata compressa, 1.9–2 mm lg., pilis subadpressis obtecta.

Habitat in pratis et declivitatibus stepposis montium transbaicalensium.

Typus. Provincia Zabaikalskaja. Montes Nerczinsk. Prope opp. Kluczevskoje. Bolschoi Kadaluj, in pratis. 6. VIII. 1911, n° 4989 fl. V. Smirnov. In Herb. Inst. bot. Acad. Sc. URSS (Leningrad) conservatur.

Ab *E. podolico* Bess. caule et involucri phyllis rubescentibus, capitulis majoribus, pubescentia dispersa, acheniis pappo 4-plo brevioribus differt.

21. **E. pseudoseravschanicus** Botsch. sp. n.

Perennis, rhizomatic ramosa. Caules pauci, recti, ramosi, virides vel interdum purpurascentes, 5–60 cm lg. et 1–3 mm in diam., pilis longiusculis multicellularibus patentibus et glandulis capitatis stipitatis interdum pilis brevibus adpressis intermixtis obteci. Folia viridia, integerrima, supra et subtus pilis sparsis, longiusculis, multicellularibus, patentibus ornata, interdum tantum marginibus ciliatis, supra et subtus glanduls capitatis stipitatis instructa; basalia longipetiolata, lanceolata, acuta, 2–15 cm lg. et 3–16 mm lt.; caulina 0.3–13 cm lg. et 0.5–11 mm lt., inferiora basalibus similia, superiora sessilia, lanceolata, acuta. Inflorescentia corymboso-racemosa; capitula in typo numerosa, 7–14 mm lg. et 1.3–3 cm lt. Involucri phylla viridia, interdum rubescentia, disco vix breviora, lineari-lanceolata, acuta, pubescentia, pilis longis, multicellularibus, patentibus glandulis capitatis stipitatis intermixtis, interdum glandulis dominantibus; interiora 5–6.5 mm lg. et 0.8 mm lt., exteriora duplo breviora. Flosculi radii feminei, in parte superiore pubescentes, pilis sparsis, brevibus, adpressis, dimorphi; exteriores ligulati 5.8–8.5 mm lg. (tubi 2.2–3.5 mm lg.), ligulae roseae vel lilacinae, ca. 0.3 mm lt.; interiores tubulosi, ecolorati, eorum tubi 2.2–3 mm lg., stylus tubo 1.1–1.5 mm longior. Flosculi disci hermaphroditi, tubulosi, 4–4.7 mm lg., quinquedentati, denticulis roseis, tubi in parte superiore pubescentes, pilis sparsis adpressis. Pappus biserialis, setae exteriores brevissimae, interiores 4–5.3 mm lg. Achenia oblonga-lanceolata, 2–2.2 mm lg., pilis adpressis dense vestita.

586 Habitat in declivibus herbaceis et inter arbores et frutices montium Asiae Mediae et Altai.

Typus. Turkestania. Prov. Fergana, distr. Osch. pr. Gulcza. In trajectu Czigirczik (2180 m s. m.) 2. VII. 1900, fl. et fr. W. Tranzschel. In Herb. Inst. bot Acad. Sc. URSS (Leningrad) conservatur.

Ab *E. orientali* Boiss. ob pubescentiam differt: pilis longiusculis sparsis glandulis stipitatis intermixtis totae plantae et pilis brevibus ad tubos flosculorum femineorum ab *E. tianschanico* Botsch. ligulis roseis vel lilacinis nec caeruleis differt; ab *E. Krylovii* Serg. pilis longiusculis numerosis differt.

22. **E. hissaricus** Botsch. sp. n.

Perennis. Caudex ramosus multiceps. Caules floriferi virides, recti, foliosi, saltem in parte superiore ramosi, pilis sparsis longuisculis multicellularibus patentibus atque pilis numerosis brevibus adpressis et glandulis capitatis brevistipitatis intermixtis obtecti. Folia mollia, viridia, integerrima, supra et subtus pilis sparsis longiusculis multicellularibus patentibus ornata rarius ad marginem ciliata; basalia longipetiolata, oblanceolata, obtusata, 3–10 cm lg. et. 5–16 mm lt.; caulina 0.4–10 cm lg. et. 0.5–14 mm lt., inferiora basalibus similia, superiora lanceolata, acuta, sessilia. Inflorescentia corymboso-racemosa; capitula pauca, 8–11 mm lg. et. 1.5–2 cm lt. Involucri phylla disco breviora; viridia, lineari-lanceolata, acuta, pilis longissimis, rigidiusculis, multicellularibus patentibus glandulis capitatis stipitatis intermixtis obtecta; interiora 6.5–8.5 mm lg. et. 0.7 mm lt., exteriora duplo breviora. Flosculi radii feminei, tubo ex toto pubescentes, dimorphi: exteriores ligulati (ex parte breviligulati) 6–6.8 mm lg. (tubus 3–3.5 mm lg.), ligulae pallide roseae, ca. 0.3 mm lt.; interiores tubulosi, ecolorati, 3–3.5 mm lg., stylus tubo 1.4 mm longior. Flosculi disci hermaphroditi, 4.5–5 mm lg., tubulosi, quinquedentati dentibus roseis, tubus in parte superiore pubescens, pilis sparsis brevibus adpressis. Pappus biserialis setae exteriores brevissimae, interiores 4.5–6.5 mm lg. Achenia oblongo-lanceolata, compressa, 2.5–3.5 mm lg., pilis longiusculis subadpressis vestita.

Habitat in fissuris rupium montium Hissar (Asia Media).

Typus. Declivitas meridionalis montium Hissar. In faucibus Chodsha-Obi-Garm (systema fl. Varsob), h = 1800 m, 4. VII, 1946, n° 291, fl. et fr., V. Pisjaukova. In Herb. Inst. Bot. Ac. Sc. URSS (Leningrad) conservatur.

Ab *E. Schmalhauseni* M. Pop. caulibus viridibus rectis, foliis oblanceolatis mollibus, nec coriaceis, sparse pubescentibus sat differt.

23. **E. badachschanicus** Botsch. sp. n.

Perennis. Caules pauci 25–52 cm lg. et 1–2 mm in diam. erecti ramosi, foliosi, in parte superiore virides, in parte inferiore rubescentes, pilis sparsis rigidiusculis longiusculis multicellularibus patentibus et brevibus adpressis praecipue sub capitulis intermixtis glandulis capitatis stipitatis vestiti. Folia basalia longipetiolata, oblanceolata, obtusata, serrato-crenata, marginibus pilis longiusculis multicellularibus instructis, lamina supra et subtus pilis brevibus adpressis ornata, viridis, petiolo nervisque 587 rubescentibus, 2.5–13 cm lg. et 3–18 mm lt.; caulina lanceolata, acuta, integerrima, viridia, marginibus longe ciliata, supra et subtus pilis brevibus adpressis vestita, 0.3–3.5 cm lg. et. 0.25–4 mm lt. Inflorescentia paniculata; capitula 8–10 mm lg. et 12–20 mm lt., ramulis longis tenuibus. Involucri phylla rubescentia disco breviora, lineari-lanceolata, acuta, glandulis capitatis brevistipitatis dense vestita, interiora 4.5–5 mm lg. et 0.7–0.9 mm lt., exteriora duplo breviora. Flosculi radii feminei dimorphi; exteriores ligulati (partim brevissime ligulati), 6–7 mm lg., eorum tubi 3 mm lg. pubescentes, pilis brevibus adpressis; ligulae caeruleae, ca. 5 mm lt.; interiores tubulosae ecoloratae, ca. 2.5 mm lg., flosculorum tubi ex toto pubescentes pilis brevibus adpressis, stylus caeruleus tubo 1.7 mm longior. Flosculi disci hermaphroditi, tubulosi, quinquedentati, flavi dentibus caeruleis tubo ex toto pubescentes, 4.5–5.7 mm lg. Pappus biserialis, setae exteriores brevissimae, interiores ca. 5.2 mm lg. Achenia oblongo-lanceolata, compressa, ca. 2.6 mm lg., pilis rigidiusculis subadpressis dense obsita.

Habitat: Pamir occidentalis.

Typus. Pamir occidentalis. Prope urb. Chorog. Hortus botanicus, h = 2320 m. 25 IX 1942, n° 41 fl. et fr. G Nepli. In Herb. Inst. Bot. Ac. Sc. URSS (Leningrad) conservatur.

Affinis *E. elongata* Ldb., sed foliis basallibus valde dentatis, acheniis pappo duplo brevioribus, ligulis caeruleis ab eo optime differt.

24. **E. psendoelongatus** Botsch. sp. n.

Perennis. Caules solitarii vel pauci, erecti vel adscendentes 3–35 cm alt. et 1–3 mm in diam., rubescentes, foliosi, in parte superiore ramosi, pilis brevibus adpressis interdum unacum pilis longiusculis multicellularibus patentibus intermixtis vestiti. Folia viridia marginibus ciliatis vel supra et subtus pilis sparsis, multicellularibus patentibus ornata; basalia longipetiolata oblanceolata, acuta, integerrima vel denticulis solitariis instructa, 1.5–8 cm lg. et 2–8 mm lt.; caulina 0.6–9 cm lg. et 0.5–9 mm lt., inferiora basalibus similia, superiora sessilia, lanceolata, acuta, integerrima. Inflorescentia corymboso-racemosa; capitula pauca, 0.8–1 cm lg. et. 1.5–1.7 cm lt. Involucri phylla disco breviora, rubescentia, lineari-lanceolata, acuta, glandulis capitatis unacum pilis solitariis rigidiusculis, longiusculis, multicellularibus patentibus intermixtis vestita; interiora 5–6.7 mm lg. et 0.6–0.9 mm lt.; exteriora interioribus duplo breviora. Flosculi radii feminei dimorphi: exteriores ligulati 5.7–7.6 mm lg. (tubo 3–4 mm lg.), eorum tubi in parte superiore rubescentes, pilis brevibus adpressis, ligulae roseae edenticulatae, ca. 0.3 mm lt., interiores tubulosi, 3.2–3.6 mm lg., in parte superiore pubescentes, pilis brevibus adpressis: stylus tubum 1.2–1.4 mm superans. Flosculi disci 4.8–5.5 mm lg. hermaphroditi, tubulosi, quinquedentati, flavi dentibus roseis, eorum tubi in parte superiore pubescentes, pilis dispersis adpressis. Pappus biserialis, setae exteriores brevissimae, interiores 4.5–5.8 mm lg. Achenia oblongo-lanceolata, compressa, 1.7–2.4 mm lg., pilis sparsis subadpressis obsita.

Habitat in pratis subalpinis, glareis, morenis montium Caucasi.

588 Typus. Provincia Terskaja. Flumen Czegem superior. In morenis glaciei Schaurtu (Tech engi) 2100–2400 m s. m. 6. VIII. 1911, fl. E. et N. Busch. In Herb. Inst. Bot. Ac. Sc. URSS (Leningrad) conservatur.

Ab *E. elongato* Ldb. acheniis pappo 2–2.5-plo brevioribus; ab *E. orientali* Boiss. caulibus rubescentibus et pubescentia dispersa differt.

25. **E. dolichostylus** Botsch. sp. n.

Perennis. Caudex lignescens, ramosus, pluriceps. Caules erecti vel ascendentes, 2–20 cm lg. et ca 1 mm in diam., foliosi, aut simplices monocephali aut semel vel raro biramosi, 2–4-cephali. Folia viridia caulesque sparse pubescentes, pilis rigidiusculis longiusculis multicellularibus patentibus et glandulis capitatis stipitatis obtecta; basalia longe petiolata lineari-lanceolata attenuato acuminata 1.5–10 cm lg. et 1.5–8 mm lt., integerrima vel interdum vix dentata, dentibus solitariis acutis; caulina lineari-lanceolata acuta 0.5–5 cm lg. et 1–6 mm lata, inferiora brevipetiolata, superiora sessilia. Capitula ca. 1 cm lg. et 2 cm lt.: involucri phylla triserialia, lineari-lanceolata subaequalia 6–7 mm lg. et fere 1 mm lt. dorso glandulis capitatis breviter stipitatis pluribus et pilis sparsis rigidiusculis sat longiusculis multicellularibus patentibus ornata, marginibus membranaceis, ad apicem fimbriata. Flosculi radii feminei ligulati pappum aequantes vel vix superantes, flavi post anthesin rubescentes, ca. 5.5 mm lg., flosculorum tubo pubescentes; ligulae reflexae ca. 2 mm lg. et 1 mm lt., ovatae apice 2–3-dentatae in sicco convolutae; stylus ligulae aequilongus. Flosculi disci 4.5–5.5 mm lg., tubulosi, quinquedentati, hermaphroditi, flavi post anthesin rubescentes, tubi in parte infetiore disperse pubescentes eorum dentes pilis longuisculis multicellularibus ornati. Pappus biserialis 4.5–5.5 mm lg., setae exteriores brevissimae solitariae; setae interiores numero 30–40 longae vel ex parte abbreviatae. Achenia modo in flosculis femineis evoluta, lanceolata, compressa ca. 4 mm lg., glandulis sessilibus et pilis sparsis rigidiusculis longiusculis subappressis ornata.

Habitat in rupibus montium Kopetdag.

Typus. Turcomania. Ad cacumen m. Risarasch in rupibus. 2700 m s. m., 10. VII. 1898, n° 1492, fl. et fr. D. Litvinov. In Herb. Inst. Bot. Ac. Sc. URSS (Leningrad) conservatur.

Ab *E. cabulico* (Boiss.) Botsch. stylo ligulae aequilongo, ligula in sicco convoluta differt.

26. **E. biramosus** Botsch. sp. n.

Perennis. Caudex lignosus ramosus pluriceps. Caules numerosi, ascendentes, dense foliosi, biramosi, 15–35 cm lg., pubescentes, pilis densis rigidiusculis longiusculis, multicellularibus, patentibus et glandulis capitatis brevistipitatis obtecti. Folia cinereo-viridia ob pubescentiam, tomentosa: pilis rigidiusculis longiusculis multicellularibus patentibus et glandulis capitatis brevistipitatis; basalia oblanceolata, acuminata, longipetiolata, integerrima vel rare serrulato-denticulata, 4–9 cm lg. et 0.5–1.3 mm lt., cito emarcida; caulina 0.5–9 cm lg. et 0.1–1.3 cm lt., caulina inferiora petiolata oblanceolata acuminata integerrima vel rarius 589 serrulato-denticulata, caulina superiora sessilia lanceolata acuminata integerrima. Inflorescentia corymboso paniculata: capitula ca. 0.9 cm lg. et 1.8 cm lt. Involucri phylla subaequilonga ca. 6 mm lg. et 1 mm lt., pappum non superantia, lineari-lanceolata sensim acuminata, dorso pilis rigidiusculis longiusculis multicellularibus patentibus et glandulis capitatis brevistipitatis dense obtecta; omnia marginibus membranacea et ad apicem fimbriata. Flosculi radii pallido flavi feminei ligulati, ca. 5 mm lg., eorum tubi in parte media disperse pubescentes; ligulae reflexae ca. 2.5 mm lg. et 0.8 mm lt., oblongo-obovatae apice 2–3-denticulatae; stylus ligula brevior. Flosculi disci hermaphroditi, tubulosi, quinquedentati, pallido flavi, ca. 5 mm lg., eorum tubi in parte media disperse pubescentes dentibusque pilis sparsis longiusculis rigidiusculis multicellularibus patentibus ornatis. Pappus biserialis, setae exteriores solitariae breves, interiores numero usque 35 longiores ca. 5 mm lg. Achenia in flosculis femineis evoluta, pilis longiusculis rigidiusculis subadpressis obtecta.

Habitat in declivibus humidis (2500–3000 m s. m.) montium Hissar.

Typus: Montes Hissar, inter flum. Kanadara et Luczeb 2900 m s. m. 16. VII. 1933. n° 599, fl. F. Zaprjagaev. In Herb. Inst. Bot. Ac. Sc. URSS (Leningrad) conservatur.

Proximus *E. cabulico* (Boiss.) Botsch. sed caulibus biramosis, ligulis pallido flavis differt: ab *E. khorossanico* Boiss. ligulis evolutis et foliis integerrimis sat distat.

ANAPHALIS DC.

27. Sect. **Anaphalis** sect. nova.

§ 1 DC. Prodr. VI (1837) 272. —Sect *Himalayanae* Clarke, Comp. Ind. (1876) 101 p.p. —Calathidia in numero 1–3, majuscula, 8–10(12) mm in diam. Folia caulina apice scariosa. Herbae non elatae, rhizomatibus tenuibus, lignescentibus.

Typus sectionis. *A. sarawschanica* (Winkl.) B. Fedtsch.

28. Sect. **Polycephalos** Boriss. sect. nova.— § 2 et § 3 DC. Prodr. VI (1837) 272. 274. —Sect. *Himalayanae* Clarke, Comp. Ind. (1876) 102; p. p. —Calathidia numerosa inflorescentiam corymbosam vel paniculato-carymbosam vel capitatam formantia. Suffruticuli, rarius herbae; radix lignescens, robusta; caules numerosi; folia apice non scariosa, acute vel breviter apiculata vel obtusa.

Typus sectionis: *Anaphalis virgata* Thoms.

29. **A. tenuicaulis** Boriss. sp. nova.

Perennis; radix longa, lignosa, tenuis. Caules numerosi, 18–20 cm alt., basi lignescentes, fusci, erecti vel adscendentes dense foliosi, superne vix tomentoso-pilosi vel subglabri; folia alterna ± sursum vergentia sessilia, oblonga lanceolata, rarius lineari-lanceolata, saepius 2 cm lg., 3 mm lt., 590 acuta vel acuminata, integerrima, basi subdilatata, amplexicaulia, tenuia utrinque paulo (supra minus) tomentoso-pubescentia. Inflorescentia corymboso-paniculata, 1.5–3 cm lt., in parte superiore ramosa, calathidiis in numero 3–20, pedunculis tenuibus tomentoso-pilosis. Calathidia masculina ca. 8 mm lt. 5 mm alt. Involucri phylla 4–5 serialia, exteriora ovata vel oblonga, interiora oblongo-lanceolata, omnia obtusa, interdum inaequaliter laciniato-dentata, in parte superiore roseo-alba basi brunnescenti-fusca et tomentoso-pubescentia. Receptaculum convexum, foveolatum; flosculi masculini ca. 4 mm lg., campanulato-tubulosi, quinquedentati, interdum glandulosi; pappus corollae subaequilongus pilis apice pinnato-dilatiatis; antherae et stylus in tubo dispositi, $^{2}/_{3}$ corollae attingentes vel corolla paulo breviores; antherae appendicibus longis filiformibus munitae; stylus apice integer, pilis longis vestitus (sub lente); flosculi feminei ignoti. Fl. VIII.

Habitat in decliviis lapidosis.

Typus. Darvas, 1–15 VIII 1914, leg. N.N. Tuturin et P.I. Besedin, n° 469. In Herb. Inst. Ac. Sc. (Leningrad) conservatur.

Asia Media: Pamiro-alai (Darvas).

Affinitas: A. proxima *A. possietica* Kom. foliis 2 cm lg., 3 mm lt. (nec 3–5 cm lg. et 4–10 mm lt.) basi dilatatis et amplexicaulibus, nec basi cuneatis et breviter differt.

30. **A. depauperata** Boriss. sp. nova.

Suffruticuli basi lignescentes; radix lignosa, radices laterales numerosae tenues. Cules crassiusculi, numerosi, 15–30 cm alti dense foliosi, albidi, dense tomentosi; folia alterna ± sursum vergentia, sessilia amplexicaulia, lanceolata vel oblongo-lanceolata interdum lineari-lanceolata, basi subdilatata, 2–2.5 cm lg., 2–6 mm lt., integerrima, apice acutiuscula, interdum breviter atro-mucronulata, utrinque albo-tomentosa, uninervia. Inflorescentia corymboso-capitata, 1.5–3 cm lt., 1.3 cm alta, calathidiis in numero 3–15 pedunculis crassis tomentoso-pubescentibus; calathidia pistillata 8–10 mm lt., ca. 8 mm alta; involucri phylla 7–8-serialia; involucri phylla exteriora ovata, media oblonga, interna lanceolata vel spathulato-lanceolata, in medio fusco-maculata, basi viridia apice alba vel rosea, scariosa, omnia obtusa, inferne tomentoso pilosa, subdeclinata, floribus aequilonga; flosculi feminei virdiusculi, filiformiter tubulosi ca. 5 mm longi. apice breviter denticulati et glandulosi, stylo bifido e corolla exserto; pappus corollam subaequans, pilis tenuibus scabris; flosculi steriles, hermaphroditi in centro calathidii dispositi, in numero 5–6, campanulato-tubulosi, ca. 5 mm lg.: pappus corollam aequans pilis scabri-pinnatis; stylus integer et tubus antherifer corollam subaequantes, vel paulo exerti; calathidia masculina 6–7 mm in diam.: involucri phylla ovato-oblonga, acutuiscula; flosculi masculine ca. 4 mm lg. campanulato-tubulosi, quinquedentati, apice glandulosi; tubus antherifer et stylus integer non exerti; pappus pilis pinnatis, corollam aequantibus vel paulo superantibus. Achenia ca. 1 mm lg., 0.25 mm lt., fusca. scabra. Fl. VII.

Habitat in decliviis lapidosis regionis alpinae et subalpinae. ca. 2800 m s. m.

591 Typus: Asia Media, systema fluminis Vahsch. fl. Abducagor, ca. 2800 m s. m. 7 VII 1949, leg. Krinitzkaja, In Herb. Inst. bot. Ac. Sc. U.R.S.S. (Leningrad) conservatur.

Area geographica: Jugum Ferganense (trajectus Kugart), Pamiro-alaj.

Affinitas: Nostra species a proxima *A. velutina* Krasch. foliis lanceolatis et oblongo-lanceolatis 2–2.5 cm lg., 2–6 mm lt., nec lineari-lanceolatis, 2–4 cm lg., 2–7 lt., involucri phyllis 7–8 nec 4–5 serialibus, acheniis scabris, ca. 1 mm lg., 0.25 mm lt. nec laevibus glabrisque, 1.5 mm lg., 0.5 mm lt. atque area geographica differt.

31. **A. garanica** Boriss. sp. nova.

Suffruticuli, basi lignescentes; caules virgati, 30–40 cm alt., suprene vix villosi, inferne subglabri; folia 2–3 cm lg., 1–4 mm lt. linearia vel anguste-linearia, acuminata et breviter mucronulata, utrinque breviter tomentosa, subtusdensius, marginibus interdum revoluta. Inflorescentia corymboso-paniculata, densa et multiflora; folia bractenea linearia, ca. 0.5 mm lg., acuminata, subtus glabra, supra tomentoso-pilosa. Calathidia feminea ca. 10 mm lt., 7 mm lg., tenuiter pedunculata, brevissime pubescentia; involucri phylla 4–5 serialia, lanceolata vel languste-lanceolata, in parte superiore albida, inferiore viridia, scariosa, margine hyalina, involucri phylla externa fuscata, basi perplexe et laxe pilosa, apice obtusiuscula, interdum laciniato-dentata; receptaculum alveolatum, squamis scariosis instructum; flosculi feminei ca. 5.5 mm lg., filiformiter tubulosi superne glanduliferi, stigma exertum bifidum longe-ramosum; pappus tenuiter pinnatus corollae subaequilongus vel paulo brevior; flosculi steriles hermaphroditi in centro calathidii dispositi in numero 2–3, campanulato-tubulosi, quinquedentati ca. 5 mm lg., superne glandulosi; pappus corollae subaequilongus pilis tenuiter pinnatis; tubus antherifer corollam subaequans. Achenia ca. 1 mm lg., anguste-oblonga (nondum matura) basi et apice truncata. Calathidia masculina ignota Fl. VII.

In decliviis lapidosis.

Typus: Buchara, distr. Garan, in lapidosis ripariis pr. angustias Abcharv infra p. Rung ad fl. Pjandsh, ca. 2400 m s. m. 30 VII 1901, leg. Alexeenko n° 1758. In Herb. Inst. bot. Ac. Sc. U.R.S.S. (Leningrad) conservatur.

Affinitas: A. proxima *A. racemifera* Franch. caulibus inferne glabris vel subglabris, (nec albo-tomentosis), involucri phyllis lanceolatis vel anguste-lanceolatis) nec exterioribus ovatis, interioribus oblongis vel lineari-lanceolatis, papis corollae aequilongis vel brevioribus (nec corollam superantibus) atque area geographica (Pamiro-alaj non Tjan-Schan) distinguitur.

32. **A. darvasica** Boriss. op. nova.

Suffruticuli; radix robusta, lignosa, radicibus lateralibus tenuibus, filiformibus. Caules numerosi, basi alte lignescentes fusci et glabri, in
592 parte media pallide grisei, dense arachnoideo et tomentoso-pubescentes, erecti vel adscendentes, simplices, 40–60 cm alt., dense foliosi. Folia

alterna sursum vergentia et partim horozontaliter patentia, sessilia, lineari-lanceolata, 3–4 cm lg., 3–5 mm lt., apice acuta et breviter crassi-mucronulata, integerrima, utrinque tomentoso-pubescentia, subtus densius. Inflorescentia corymboso-paniculata, effusa, densa; folia suprema bracteanea linearia, 5–10 mm lg., ca. 1 mm lt., acuta; calathidia numerosa, ca. 4 mm lg., ca. 3mm lt., breviter et tomentoso-pedunculata; involucri phylla 3–4-serialia, in parte superiore albido-scariosa, extus arachnoidea, perplexe pubescentia, oblongo-lanceolata involucri phylla media et interiora ca. 3 mm lg., exteriora 3 mm lg. et 2 mm lt., in parte media interdum fusca, integerrima apice rotundata interdum laciniata, lacerata vel inaequaliter marginata; flosculi albidi, in sicco fusci vel flavescentes, tubulosi; flosculi feminei tubulosi, tenues, non filiformes; stylus corollam vix superans; stigma subbifidum; pappus ca. 3 mm lg., corollae subaequilongus, pilis tenuibus, scabris; flosculi steriles, hermaphroditi, quinquedentati, in numero 1–2 in centro calathidii dispositi; tubus antherifer vix evolutus, in corolla occultatus; pappus corollae aequilongus vel subaequilongus, pilis in parte superiore pinnato-dilatitis; calathidia masculina ca. 5 mm lg., 3 mm lt., flosculi antheriferi ca. 3 mm lg.; pappus corollae subaequilongus pilis apice pinnato-dilatitis; corolla campanulato-tubulosa, quinquedentata; antherae corolla sublongiores. Achenia oblongo-ovata. 1 mm lg., 0.5 mm lt., bunnescentia. Fl. VII–IX.

Habitat in decliviis lapidosis et saxosis, 2000–3500 m s. m.

Typus: Schugnan, prope Derbent, supra coitum amnium Pjandsh et Murgab, 29 IX–10 X 1882, leg. A. Regel, fl. In Herb. Inst. bot. Ac. Sc. U.R.S.S. (Leningrad) conservatur.

Area geographica: Pamiro-alaj, Schugnan.

Affinitas: A proxima *A. scopulosa* Boriss. caulibus dense tomentosis (nec subglabris), dense foliosis (non parce foliosis), foliis dense tomentosis sursum vergentibus (nec subglabris declinatis); involucri phyllis oblongo-lanceolatis 3–4 serialibus (nec lanceolato-linearibus vel linearibus, nec 5–6 serialibus). floribus ca. 3 mm lg. (nec 4–5 mm lg.). Acheniis oblongo-ovatis, 1 mm lg., 0.5 mm lt. (nec lanceolatis 1.25 mm lg., 0.3 mm lt.) differt.

33. **A. scopulosa** Boriss. sp. nova.

Suffruticulus, basi tantum lignescens; radix longa, lignosa; caules virgati, 30–50 cm alt., inferne glabri, superne ± pilosi, interdum striis pilosis instructi, glanduliferi; folia alterna, sursum vergentia ± distantia, sessilia, lineari-lanceolata vel linearia, (1.5)2–4 cm lg. 1–4 mm lt. integerrima, saepe margine revoluta. uninervia, acuminata, apice mucronata, mucrone glabro ca. 1 mm lg., untrinque tomentoso-pubescenti, interdum tomento detersibili. Inflorescentia corymbosa vel corymboso-paniculata, 1.5–7 cm lt. calathidia numerosa pedunculis albide tomentosis,

involucri phylla flores superantia, 5–6 serialia, exteriora lanceolata,
interiora linearia, in parte superiore nivea, basi viridi-flavescentia et
tometosa mambranaceo-hyalina, interiora glandulosa, obtusiuscula;
593 calathidia feminea 4–5 mm in diam.; flores feminei ca. 4 mm lg., tenuiter
tubulosi, apice glandulosi et 4-dentati; stigma corollam vix superans,
bifidum; pappus corollae aequilongus, pilis scabridis; flores steriles, in
centro ca. 3 mm lg., stigma corollam superans, crassum, breviter bifidum,
antherae et pappus corollae subaequilongi; pappus pilis pinnatis;
flores masculini ca. 4-pinnato-dilatatis et planis; achenia lanceolata, ca.
1.25 mm lg., 03 mm lt., fusca, obtusa laevia. Fl. VII.

Habitat in decliviis labidosis, in fissuris rupium, ca. 2000 m s. m.

Typus: Pamiro-alaj, Schugnan, prope p. Nischus ad fl. Pjandsh, in decliviis lapidosis 9 VIII 1897, leg. S. Korshinsky, fl. fem. In Herb. Inst. Bot. Ac. Sc. URSS (Leningrad) conservatur.

Area geographica: Pamiro-alaj, Schugnan.

Affinitas: A proxima *A. darvasica* Boriss. caulibus subglabris (nec dense tomentosis) parce foliosis (nec dense foliosis) foliis subglabris, declinatis (nec dense tomentosis sursum vergentibus) involucri phyllis lanceolato-linearibus vel linearibus. 5–6 serialibus (nec oblongo-lanceolatis, nec 3–4 serialibus), floribus 4–5 mm lg. (nec ca. 3 mm lg.) acheniis lanceolatis, 1.25 mm lg. 0.3 mm lt. (nec oblongo-ovatis, 1 mm lg., 0.5 mm lt.) differt.

BIDENS L.

34. **B. kamtschatica** Vass. sp. nova.

Annua, caules erecti simplices, ± rubescentes, glabri vel puberuli. Folia oblongo apice acuta petiolata margine obtuse-dentata pilis brevibus obsita. Calathidia terminalia paulo compressa; involucri phylla externa viridia oblongo calathidium superantia, phylla interna latelanceolata margine membranacea, flosculos aequilonga; bracteae lineari-lanceolatae. Achaenia late cuneata plana 3 mm lg., 2 mm lt. (in parte superiore), atripurpurea, apice aristis duabus paulo curvatis remotisque 1–1.5 mm lg. margine pilis retrorsis densis obsita, superficiebus latioribus costula mediana praeditis.

Habitat prope fontes calidos vulcanicos.

Area geographica: Peninsula Kamtschatka.

Typus: Kamtschatka, ad summitatem vulcani Uson 24 VIII 1909, leg. V. Komarov; in Leningrad asservatur.

A *B. cernua* L. achaeniis minoribus aristis duabus, a *B. connata* Muhl. achaeniis laevibus (nec tuberculatis minoribus) 2–3 mm lg. (nec 5–7.5 mm lg.) differt.

605

INDEX ALPHABETICUS*

nominum specierum atque synonymorum plantarum in tomo XXII Florae URSS commemoratarum

Pag.

Abrotanoides DC., sect. 3, 504
Acanthollena DC., sect. 300, 302
Acanthoplia (*Spinosa*) Wallroth, sect. 522
Acanthoxanthium DC., sect. 522
Acres Novopokr., sect. 143
Adenocaulon Hook 506
— adhaerescens Maxim 507
— bicolor Hook 507
— hymalaicum Edgew 507
Adenostyles Cass. 22
— *albida* Cass. 22
— *albifrons* Rchb. 22
— alliariae (Gauan) Kern. 22
Adenostylinae O. Hoffm., subtrib. 22
Aegophthalmus Schott and Kotschy, sect. 471
Ageratinae O. Hoffm., subtrib. 17
Ageraton Tamamsch., sect. 96
Ageratum L. 17
— Houstonianum Mill. 17
— obtusifolium Lam. 17
Alpigeni Nees. 104
Alpinae, Grex 347, 350
Alpinaster Tamamsch., sect. 104
Amblyocarpum Fisch. and Mey. 497
— inuloides Fisch. and Mey. 497
Ambrosia L. 517
— aptera DC. 520
— artemisiifolia L. 518, 519
— psilostachya DC. 519
— trifida L. 520, 521
Ambrosiaceae Link 512
Ambrosieae Cass., trib. 512
Ambrosieae Rydb., trib. 517
Ambrosiees Baill., trib. 512
Ambrosiinae O. Hoffm. p. p., subtrib. .517
Amellus Nees, sect. 85
Anaphalis DC. 361
— sect. 364, 589
— aurora Rech. f. and Edelb. 374
— darvasica Boriss. 375, 588, 590

Pag.

Anaphalis depauperata Boriss. 371, 590
— garanica Boriss. 373, 591
— *leptophylla* auct. 372
Anaphalis margaritacea (L.) Benth. and Hook. f. 365
— *monocephala* DC. 364
— nubigena DC. 364
— possietica Kom. 366, 587
— racemifera Franch. 363, 588
— roseo-alba Krasch. 374
— scopulosa Boriss. 376, 592
— serawschanica (Winkl.) B. Fedtsch. 364, 586
— tenuicaulis Boriss. 367, 589
— velutina Krasch. 368, 588
— virgata Thoms. 374, 586
Anoplia (*inermia*) Wallorth, sect. 523
— Trib. A. *Orthorryncha* Wallr. 523
— Trib. B. *Campylorrhyncha* Wallr. ..525
Antennaria Ciaertn. gen. 326
Antennaria auct. 342, 354
— alpina (L.) Gaertn. 335, 336, 338
— — Lessing. 334
— — Ldb. 338, 340
— — Hulten. 335
— — auct. 337
— — (L.) R. Br. 336
— — var. *Friesiana* Juz. ex Kom. 337
— — var. *Friesiana* Trautv. 337, 338
— — var. *monocephala* Trautv. 337
— — var. *pleiocephala* Trautv. 337
— — var. *typica* Fernald. 336
— — β. *monocephala* Torrey and Gray 334
606 — angustifolia Ekman. 338
— aprica Greene. 330
— carpatica (Wahlenb.) R. Br. 338, 340, 341
— — Trautv. 338
— — Ldb. 336
— — Bluff. and Fing. 338

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Antennaria alpina auct. 340
—— var. Laestadiana Trautv. 340
—— var. β. Wahlenb. 338
— caucasica Boriss. 330
— dioica (L.) Gaertn. 329, 333, 334
—— Hulten. 334
—— (L.) Gaertn. ex Hulten. 329
—— auct. 330
— dioiciformis Kom. 334
— Friesiana (Trautv.) Ekman. 335, 337, 338
— *hyperborea* D. Don. 329
— Komarovii Juz. 335
— labradorica Nutt. 338
— *leontopodina* DC. 353, 354
— *leontopodium* Gaertn. 360
— *margaritacea* R. Br. 365
— monocephala DC. 334, 335
— *montana* S. F. Gray 329
— *nana* Hook. f. and Thoms 359
— neo-dioica Greene. 330
— *parviflora* Nutt. 329
— rosea Greene. 330
— *rubicunda* C. Koch. 412
— *serawschanica* Winkl. 344
— Steetziana Turcz. 349, 354
— villiefera Boriss. 340
—— Boriss. var. ircutensis Boriss. ...341
—— Boriss. var. jacutica Boriss. 341
—— Boriss. var. septentrionalis Boriss. 341
Arctogeron DC. 135
— gramineum (L.) DC. 136
Aster L. 77, 111
— abchasicus Kem.-Nat. 116
— acer auct. 155, 162
—— var. discoideus Schmalh. 151
—— var. discoideus Korsh. 151
—— var. saxatilis M. Pop. ex Novopokr. 163
—— var. typicus Korsh. 155
— acutisquamoides Novopokr. 157
— adustus Koidzumi. 100
— ageratoides Turcz. 100, 104
— *ageratoides* auct. 99, 102
—— var. *adustus* Maxim. 101
—— var. *holophyllus* Maxim. 103
— alpinus L. 79, 105, 106, 107, 220
— *alpinus* auct. 108
—— ssp. *dolomiticus* Onno. 105
—— ssp. *Vierhapperi* Onno. 106, 109
—— var. *acutisquameus* Kem.-Nat. ..105
—— var. *brachyglossus* Onno. 107
Aster *alpinus* var. *calcareus* Kem.-Nat. 105
—— var. *cylleneus* Onno. 108
—— var. *dahuricus* Lindl. 109
—— var. *nivalis* DC. 105
—— L. var. *petiolaris* Winkl. 220
—— L. var. *pleiocephalus* auct. 107
—— var. *polycephalus* auct. 107
—— f. *discoideus* auct. 107
— altaicus Willd. 66
—— Nakai. 72
—— var. *canescens* (Nees) Serg. 67
—— var. *distortus* (Turcz.) Poplav. 66
—— var. *tubulosus* Kitamura. 69
—— β. *medius* Kryl. 68
— amellus L. 79, 86, 88, 107
—— var. *amelloides* Schmalh. 87
—— var. *bessarabicus* DC. 87
—— var. *daghestanicus* Kem.-Nat. 87
—— var. *major* Ldb. 87
—— f. *ibericus* Nees. 87
— amelloides Bess. 87
— *andryaloides* B. Fedtsch. 274, 275
— *angustissimus* Tausch. 167
— *angustus* Torr. and Gray. 189
— *annuus* L. 244
— *arcticus* East. 96
— *argunensis* DC. 217
— *bessarabicus* Bernh. 87
— *biennis* Ldb. 71
— *bifidus* Nees. 151
— *bipunctatus* Novopokr. 145
— *brachyactis* Blake. 189
607 — sect *Calimeris* Benth. and Hook. 110
— subsect. *Calimeris* Hoffm. 122
— *Capusi* Franch. 267, 268
— Capusii auct. 131
— *Caroli Ledebourii* Novopokr. 166
— *carnosus* Gilib. 184
— sect. *Caucasica* Kem.-Nat. 110
— *caucasicus* Willd. 112
— *chinensis* L. 74
— *chromapappus* Novopokr. 149
— *chryzocomoides* DC. 107
— *ciliatus* B. Fedtsch. 189
— *ciliosus* Kitamura. 72
— *cinereus* Korsh. 178
— *colchicus* Alb. 117
—— auct. 117
— consanguineus auct. 213, 215
—— Ldb. 213
—— Ldb. f. flor. albis Hultén. 212
— *coriaceus* Novopokr. 156
— *crinitoides* Novopokr. 168

Aster *cylleneus* Onno. 108
— *dahuricus* (DC.) Benth. 143
— *depauperatus* Lév and Van. 72
—— var. parviceps Gray. 84
— *distortus* Turcz. 66
— *divaricatus* (Fisch. ex M.B.) Schmalh. 171
— *dracunculoides* Lam. 162
—— *discoideus minor* Ldb. 179
— *dubius* Onno. 215
— *dysentericus* Scop. 490
— *ensifolius* Scop. 450
— *eremophilus* Bge. 132
— *espenbergensis* Nees. 96
— fallax Tamamsch. 109, 580
— *fastigiatus* Fisch. 137
—— Ldb. 166
—— Lehm. ex Nees ab. Esenb. 166
— *fastigiiformis* Novopokr. 157
— Fauriei Lév. and Van. 93
— *flaccidus* Bge. 217
—— auct. 217, 218
—— f. *atropurpureus* Onno. 109
— *Fischerianus* DC. 95
— *flexuosus* Fisch. 95
— *fruticosus* auct. 126
— *glaberrimus* Novopokr. 153
— *glabratus* (Lindl.) Korsh. 179
— glarearum Farrer. 217
— Glehnii Fr. Schm. 91, 104
— *Grimmii* Fedtsch. 181
— Gmelini Tausch. 66
— *gymnocephalus* B. Fedtsch. 285
— *Hauptii* Ldb. 166
—— Turcz. 143
—— var. tenuifolius (Lindl.) Schmalh. 167
— *helenium* Scopoli. 440
— *heterochaeta* Benth. 217, 218, 219
— *heteropappoides* Novopokr. 125
— *hirtus* Scop. 448
— *hispidus* Thunb. 69
— *hissaricus* Novopokr. 158
— *holophyllus* Hemsl. 123
— *horridifolius* Lév. and Van. 93
— ibericus Stev. 87
—— var. coloratus Kem.-Nat. 88
—— var. hirsutus Kem.-Nat. 88
— *imbricatus* Walp. 186
— *incisus* Fisch. 124
— *integrifolius* Franch. 123
— *intermedius* Turcz. 217
— *iphionides* Schultz Bip. 172

Aster *ircutianus* DC. 94
— *japonicus* Less. 215
— *kansuensis* Farrer. 217
— *kirgizorum* Korsh. 171
— *Koidzumanus* Maxim. 93
— *Komarovii* Lév. and Van. 121
— *koraginensis* Kom. 212
— *Korsakoviensis* Lév. and Van. 91
— Korschinskyi Tamamsch. 107, 109, 578
— *Krascheninnikovii* Novopokr. 151
— *lacunarum* Aitch. and Hemsl. 120
— laevis L. 84
— *latisquamatus* Hand.-Mazz. 189
— *Lautureanus* auct. 99, 102
—— Franch. 57
— *Ledebourianus* Novopokr. 155
— *leptophyllus* Fisch. 167
— *limoniifolius* Fedtsch. 130
—— M. Pop. 130
— *linifolius* Grieseb. 186
— *linosyris* (L.) Bernh. 175
— *lithospermifolius* DC. 67
— *litoralis* Kom. 216
— *Litvinovii* Novopokr. 158
608 — luxurifolius Tamamsch. 100, 579
— Maackii Rgl. 93
— *macrodon* Lév. and Van. 124
— *macrosciadius* Novopokr. 145
— *maritimus* Lam. 184
— *medius* Serg. 68
— *medius* var. *euphorbiifolius* Serg. 68
— *meritus* A. Nels. 96
— *Meyendorfii* Voss. 72
— micranthus Lév. and Van. 137
— *monocephalus* Boiss. 112
— *montanus* Rupr. 95
— Novae-Angliae L. 86
— Novi-Belgii L. 83
— *Novopokrovskyi* Krasch. and Iljin. .135
— *obovatus* Ldb. 130
— Oharai Nakai. 216
— *orientalis* S.G. Gmelin. 465
— *palustris* Lam. 184
— *pannonicus* Jacq. 184
— parviceps (Burg.) Mackenzie and Bush. 84
— pensauensis Tamamsch. 102, 580
— *peregrinus* Pursh. 200
— *pinnatifidus* f. *robusta* Makino. 124
— *polygaloides* Novopokr. 165
— *Poncinsii* Franch. 272, 274, 275
— *Popovii* Botsch. 131, 268
— *praecox* Meinsh. 85

Aster Prescottii Lindl. 94
— *psyschensis* Kem.-Nat. 112
— *pulchellus* Willd. 210
— *pulicarius* Scop. 189
— *pumilis* Fisch. 66
— *punctatus* W. and K. 155
— *Richardsonii* Ldb. 94
— *Richardsonii* Spreng. 96
— *Richardsonii* Schmidt. 95
— *roseus* Stev. 115
— — auct. 116
— *rossicus* Novopokr. 155
— *rupestris* M. Pop. 131
— *sachalinensis* Kudo. 94
— *salicifolius* Scholl. 84
— *salicinus* Scop. 454
— *salignus* Willd. 84 609
— *salinus* Schrad. 184
— *Savatieri* Makino. 58
— *saxatilis* (M. Pop. ex Novopokr.) Novopokr. 163
— *scaber* Thunb. 121
— *scapigerum* Ldb. 109
— *scoparius* (Kar. and Kir.) B. Fedtsch. 172
— *sedifolius* auct. 155
— — var. *discoideus* Villiams. 151
— — var. *dracunculoides* (Lam.) Williams. 162
— see-burejensis Tamamsch. 101
— serpentimontanus Tamamsch. 108
— sibiricus L. 94
— *sibiricus* Hulten. 96
— — Scheutz. 95
— — var. *meritus* Raup. 96
— — var. *pleiocephala*. 95
— — var. *riparius* Kom. 95
— — var. *subintegerrima* Trautv. 95
— — f. *alpigenus* Kom. 96
— — f. *laricetorum* Kom. 94
— — f. *litoralis* Kom. 96
— *silenifolius* Turcz. 212
— *songoricus* Novopokr. 145
— *spathulifolius* auct. 216
— *squamatus* Hieron. 186
— *squamatus* var. *graminifolius* Cabrera. 186
— *subglaber* Novopokr. 153
— subintegerrimus (Trautv.) Ostenf. and Resvoll. 95
— suputinicus Tamamsch. 99, 579
— sutschanensis Kom. 102
— *tataricus* L. 79, 92
Aster *tataricus* Fr. Schm. 93
— — var. *Faurieri* Kitamura. 93
— — var. *minor* Makino. 92
— *tianschanicus* Novopokr. 164
— *Tilesii* Wikstr. 200
— Tolmatschevii Tamamsch. 107
— — var. radiatus Trautv. 108
— *trinervifolius* Less. 153
— *trinervius* Gilib. 86
— — auct. 100, 102
— — var. *adustus* Kom. 101
— — var. *longifolia* Fr. and Sav. 92
— tripolium L. 184
— (*Tripolopsis*) Novopokr. 185
— *Tuganus* Alb. 116
— *turkestanicus* Franch. 277
— *unalachkensis* Less. 200
— *villosulus* Novopokr. 150
— *villosus* (L.) Schultz Bip. 178
— — var. *glabratus* (Lindl.) Schmalh. 179
— *virgatus* Schultz Bip. 171
— — f. *discoidea* Schultz Bip. 172
Astereae Cass., trib. 24
Astérées Baill. p.p. trib. 24, 290
Asterinae O. Hoffm., subtrib. 54
Asteriscus Sch. Bip. 508
— *spinosus* Sch. Bip. 509
Asteroideae Less., trib. 24, 290
Asteromoea integrifolia Loes. 123
— *pekinensis* Hance. 123
— *Savatieri* Makino. 58
Asterothamnus Novopokr. 124
— fruticosus (Winkl.) Novopokr. 126
— *fruticosus discoideus* Novopokr. 129
— heteropappoides Novopokr. 125
— poliifolius Novopokr. 126
— Schischkinii Tamamsch. 129, 581
Aurelia Cass. 30

Baccharidinae O. Hoffm., subtrib. 288, 289
Baccharis L. 289, 297
— halimifolia L. 289
Bellidinae O. Hoffm., subtrib. 52
Bellis L. 53
— hyrcanica Woron. 53
— *integrifolia* DC. 54
— perennis L. 54
— *scaposa* Gilib. 54
— *silvestris* auct. 54
Bidens L. 551
— bipinnata L. 561
— cernua L. 555, 556, 558

Bidens cernua L. 552
— cernua var. graveolens (Kom.) Vass. 556
— cernuus f. natans Osw. and Kling. ..551
— — β *radiata* Ldb. 558
— *chinensis* DC. 560 610
— connata Muhl. 556
— *dahurica* Amman. 560
— frondosa L. 559, 560
— *graveolens* Kom. 556
— kamtschatica Vass. 556, 593
— leucantha Willd. 551
— *macrospermus* Fisch. 560
— Maximovicziana Oett. 559
— melanocarpa K.M. Wieg. 552
— *Messerschmidtii* Turcz. 560
— parviflora Willd. 560, 561
— *platycephalus* Oerst. 558
— radiata Thuil. 552, 558
— — f. pseudocernua Ganesch. 558
— tripartita L. 551, 552, 557, 558, 560
— — var. humilis Roth. 557
— — f. perpusillus Domin. 557
— — β. *pinnatifida* Turcz. 559
— tripartita L. 552
sp. 552
Biotia Maxim. 121
— *corymbosa* var. *discolor* Rgl. 121
— *discolor* Maxim. 121
Blepharipappus elegans (Nutt.) Green. 569
Boltonia L'Hér. 57
Boltonia Benth. and Hook. 122
— *cantoniensis* Fr. and Sav. 58
— *incisa* Benth. 123
— Lauteriana Deb. 57
— *Savatieri* Makino. 58
Bombycilaena (DC.) Smoljan. 301
— erecta (L.) Smoljan. 302
— bombycinus (Lag.) Smoljan. 302
Botryadenia Gmelini Fisch. and Mey. ..52
Brachyactis Ldb. 188
— ciliata Ldb. 189, 190
— *gymnocephala* Rupr. 285, 286
— *iliensis* Rupr. 282
— latisquamata (Maxim.) Kitagawa. ..190
— linearifolia Winkl. 190
— *Roylei* (DC.) Wendelbo. 285, 286
— *umbrosa* Benth. 285, 286
— Wangtuensis Clarke. 286, 285
Brachyglossae Vierh., sect. 246
Breviligulatae (Beck) Gorschk., sect. ..473
Breviligulatae Beck, subsect. 473
Bubonium DC., sect. 443
Buphthalminae O. Hoffm., subtrib. 508
Buphthalmum L. 510
— *cordifolium* Waldst. 510
— *speciosum* Schreb. 510
— *spinosum* L. 509
— sect. 1 *Telekia* (Baumg.) Fiori. 510

Cacalia albifrons Rchb. 22
— *alliariae* Gouan. 22
— *tomentosa* Jacq. 22
Caenotus Nutt., sect. 239
Caenotus Raf. 191
— *canadensis* Raf. 239
Calimeris DC. 110
Calimeris Nees. 122
— *Alberti* Rgl. 67
— *altaica* Nees. 66
— *biennis* Ldb. 72
— *canescens* Nees. 67
— *exilis* DC. 66
— *fruticosus* Winkl. 126
— *hispida* Nees. 69
— *incisa* Turcz. 123
— *integrifolia* var. *scabra* Maxim. 57
— *japonica* Schultz. 137
— *Lautureana* Kitamura. 57
— *platycephala* Nees. 123
— *rosea* DC. 115
— *Savatieri* (Makino) Grossh. 58
— *tatarica* Lindl. 72
Calliopsis tinctoria DC. 547
Callistemma Cass. 73
— *hortense* Cass. 74
Callistephus Cass. 73
— *biennis* Lindl. 72
— *chinensis* (L.) Nees
— *hortensis* Cass. 74
Calolepis Kirp., sect. 394
Campylorrhyncha Wallroth, subsect. ..525
Cappa Avet., sect. 473
Carduoideae Kitam., subfam. 14
Carnosa Avet., sect. 447
Carpesium L. 498
— abrotanoides L. 505
— cernuum L. 501
— eximium Winkl. 502
— *manshuricum* Kitamura. 503
— *racemosum* Wall. 505
— *Thunbergianum* Sieb. and Zucc. 505
— triste Maxim. 503
— *Wulfenianum* Schreb. 505
— *Wulfenii* Schreb. 505
Catipes DC., sect. 328
Caucasica Kem.-Nat., sect. 112

Chamaegeron Schrenk. 118
— Bungei (Boiss.) Roth. 119
— oligocephalus Schrenk. 120
Chrysocoma biflora L. 151
— *conyzoides* Fisch. ex Ldb. 171
— *divaricata* Fisch. ex M.B. 171
— *dracunculoides* Lam. 151
— *graminifolia* L. 50
— *linosyris* L. 175
— *tatarica* Less. 179
— *villosa* L. 178
Chrysocomella Novopokr., sect. 177
Chrysoraphis vulgaris Rupr. 34
Cichorioideae Kitam., subfam. 14
Cladochaeta DC. 430
— candidissima (M.B.) DC. 430, 431, 432
— caspica Sosn. 430, 431, 432
Codonocephalum Fenzl. 432
— *grande* (Schrenk) B. Fedtsch. 441
— Paecockianum Aitsch. and Hemsl. .432
Compositae P.F. Gmelin. 1
Conyza L. 191
Conyza Less. 191, 239
— Spreng. 185
— *altaica* DC. 189
— *ambigua* DC. 287
— *andryaloides* DC. 274
— *Berteroana* Phil. 186
— *bonariensis* Cronq. 240
— *Britannica* Moris. 465
— *canadensis* Cronq. 239
— *crispa* Rupr. 287
— *graminifolia* Spreng. 186
— *gymnocephala* Rupr. 285
— *iliensis* Trautv. 280, 282
— *kazachstanica* Serg. ex Kryl. 282
— *khorossanica* Boiss. ex Rgl. and Schmalh. 280
— — Novopokr. ex Nevski. 280
— *Krauseana* Rgl. and Schmalh. 280
— *oleaefolia* Lam. 178
— *rhizocephala* Rupr. 472
— *Roylei* DC. 285, 286
— *salicina* Rupr. 454
— *salsoloides* Turcz. 476
— *squamata* Spreng. 186
— *squarrosa* All. 473
611 — *squarrosa* L. 473
— *thapsoides* Willd. 474
— *umbrosa* Kar. and Kir. 285
— *vulgaris* Lam. 473
Conyzanthus Tamamsch. ...185, 188, 583
Conyzanthus graminifolius (Spreng.) Tamamsch. 186
— squamatus (Spreng.) Tamamsch. 186
Conyzastrum (Boiss.) M. Pop., subgen. 239, 266, 275
Conyzella Rupr. 191
— *canadensis* Rupr. 239
— *coerulea* Rupr. 246
Conyzoides DC., sect. 501
Conyzoides Kirschleg., sect. 473
Coreopsidinae O. Hoffm., subtrib. 545
Coreopsis L. 546
— basalis (Dietr.) Blake. 548
— *bidens* L. 558
— *Drummondii* (D. Don) Torr. ex Gr. 548
— grandiflora Hoog. 547
— tinctoria Nutt. 547, 548
Corvisartia Mérat. 433, 440
— (Mérat) Dumort., sect. 440
— *caucasica* D. Don. 510
Cosmos Cav. 561
— bipinnatus Cav. 562
— diversifolius Otto. 562
— sulphureus Cav. 562
Costatae Smoljan., subsect. 520
Cotula bicolor Roth. 51
— *sonchifolia* MB. 51
Crassina Scepin. 532
Crinita Moench. 173
— *punctata* Moench. 178, 179
Crinitaria Cass. 173
Crinitaria (Cass.) Novopokr., subgen. .177
Crinitaria (Cass.) Kem.-Nat., sect. 177
— — Novopokr., sect. 177
— *biflora* (L.) Cass. 161
— *glabrata* Lindl. ex DC. ....
— *linosyris* (L.) Less. 175
— *tatarica* (Less.) Novopokr. 179
— *villosa* (L.) Cass. 178
Cyclachaena Fresen. 515
— (Fresen.) A. Gray, sect. 515
— (Nutt.) Fresen. 515
xanthifolia (Nutt.) Fresen. 515
Cyclacheninae Kirp., subtrib. 514
Cymbolaena Smoljan. 305
Cymbolaena longifolia (Boiss. and Reut.) Smoljan. 306
— — var. evacina Bornm. 307
Cyttarium Peterm. 381, 404
— *sylvaticum* Peterm. 397
— — *ramosum* Peterm. 397

Dahlia Cav. 548
— *coccinea* Cav. 548, 549
— *Juarézii* Hort. 549, 550
— *pinnata* Cav. 548, 549, 550
— *purpurea* Poir. 548
— *rosea* Cav. 548, 549
— *variabilis* (Willd.) Desf. 548, 549
— *Yarezii* Hort. 548
Dasyanthus Bub. 381
Dichrocephala L'Hér. 51
— bicolor (Roth) Schltd. 51
— *latifolia* (Lam.) DC. 51
— *sonchifolia* DC. 51
Dimorphanthes ambigua Presl. 287
— *floribunda* Cass. 240
— *linifolius* Rupr. 287
— *crispa* Rupr. 287
Diplopappus DC. 111
— *andryaloides* O. and B. Fedtsch. 274, 275
— *Capusi* O. and B. Fedtsch. 267
— — Franch. 267
— *caucasicus* DC. 112
— *chinensis* L. 74
— *dubius* Cass. 244
— *dysentericus* Bluff. and Fingerh. 490
— *pulicarius* Bluff. and Fingerh. 489
— *turkestanicus* Rgl. and Schmalh. 277
— — — — var. *serratifolius* Winkl. 268
Doelingeria Nees. 121
— scabra (Thunb.) Nees. 121
Donia squarrosa Pursh. 30
Doronicum ramosum Walt. 245

Echinancea Moench. 540
— purpurea (L.) Monech. 541
Eclipta L. 537
— alba (L.) Hasskarl. 538
— *erecta* L. 538
612 — *marginata* Steud. 537
— prostrata L. 537
Ecostatae Smoljan., subsect. 518
Elichrysum Mill. 404
— *uliginosum* Moench. 392
— *strictum* Moench. 397
— *lavandulaefolium* H.B.K. 429
— *conglomeratum* Moench. 395
— *arenarium* (L.) Moench. 410
Enula Neck., pro gen. 433, 443
Enula Duby, sect. 443
Erigeron L. 191
— acer L. 246, 247, 248
— — — 249, 250, 252
— *acer* auct. 246, 248, 266
Erigeron *acer* var. *armeriaefolius* O. and B. Fedtsch. 234
— — — *droebajhensis* Blytt. 249
— — — *droebajhensis* auct. 248
— — — *manshuricus* Kom. 248, 249
— — β. *confertum* Boiss. 261
— Alexeenkoi Krasch. 271
— — — var. mollissimus Botsch. 271
— albchrous Botsch. 203, 208
— alpiniformis Cronq. 230
— alpinus L. 252
— *alpinus* auct. 253, 258, 259
— — var. *oreades* Trautv. 236
— — — *pulchellus* Trautv. 213
— — β. *eriocalyx* Ldb. 228
— altaicus M. Pop. 203
— *amphibolus* Ldb. 227
— Androssovii M. Pop. 281
— andryaloides (DC.) Benth. 274, 275
— *andryaloides* (DC.) Benth. ex Hook. 275
— — — — var. *glandulosus* Botsch. .274
— *angulosus* Caud. 251
— *annuus* (L.) Pers. 244
— annuus auct. 245
— *arcticus* Rouy. 232, 233
— *armeriaefolius* Turcz. α. *humilis* Ldb. 234
— — — β. *elatior* Ldb. 234
— *armerifolius* Turcz. ex DC. 234
— asteroides Andrz. 249
— Aucheri Boiss. 282
— aurantiacus Rgl. 209, 210
— azureus Rgl. ex M. Pop. 203, 207, 208
— *azureus* Rgl. ex O. and B. Fedtsch. 204
— badachschanicus Botsch. 263, 586
— baicalensis Botsch. 250, 584
— bellidiformis M. Pop. 260
— biramosus Botsch. 278, 279, 588
— bonariensis L. 240, 288
— borealis (Vierh.) Simm. 253
— brachycephalus Lindb. f. 248
— brachyspermus Botsch. 269
— *Bungei* Boiss. 119
— cabulicus (Boiss.) Botsch. 231, 277, 278
— caespitans Kom. 246, 248
— canadensis L. 239
— *candidissimus* Rech. f. and Edelberg. 273
— *Capusii* Novopokr. 131, 267, 269
— caucasicus Stev. 211, 227

Erigeron chinophilum Boiss. 269, 275
— *ciliatus* Ldb. 189
— *coeruleus* M. Pop. 259, 260
— *consanguineus* Kitamura. 213
— — Novopokr. 213
— crispus Pourr. 286, 287, 288
— *cupularoides* Freyn. 189
— *depilis* Phil. 186
— *dichrous* M. Pop. 271, 277
— *discernendus* Rech. f. 237
— divergens Torr. and Gray. 244
— dolichostylus Botsch. 278, 588
— drobachiense Fr. Müll. 249, 252
— *dubius* Makino. 250
— *Edelbergii* Rech. f. and Köie. 277
— *elongatiformis* (Novopokr.) Serg. ...248
— elongatus Ldb. 247, 248, 249, 251, 252
— *elongatus* auct. 251
— eriocephalus (Ldb.) Wierh. 228, 229, 230
— eriocephalus J. Vahl. 232
— *eriocephalus* Rgl. and Schmalh. 264, 265
— flaccidus (Bge.) Botsch. 217, 219
— *glaberrimus* M. Pop. 235
— *glabratus* auct. 204
— *gramineum* L. 136
— heterochaeta (Benth. ex Clarke) Botsch. 218, 219
— *heterophyllus* Mühl. ex Willd. 244
— hirsutus Lour. 266
— hissaricus Botsch. 262, 263, 586
— humilis Grah. 233
— kamtschaticus DC. 248, 249
— — — var. *hirsuta* Fr. Schmidt. 266
— karatavicus Pavl. 272
— *kazachstanicus* Serg. 282
— khorossanicus Boiss. 280, 281, 282
— *khorossanicus* auct. 282
— *Koelzianus* Rech. f. 277
— Komarovii Botsch. 213, 214
— kepetdagensis M. Pop. 261, 262
— koraginensis (Kom.) Botsch. 212
— Krylovii Serg. 254, 258, 259
— lachnocephalus Botsch. 210, 220, 230, 231
— latisquamus Boiss. 269
— *latisquamatus* Maxim. 189
— *Ledebourianus* Novopokr. 234
— *Lehmanni* Boiss. 267
— leucophyllus (Bge.) Boiss. 272, 273, 275
— *leucophyllus* M. Pop. 273
Erigeron *leucophyllus* auct. 276
— leioreades M. Pop. 201, 203
— *linearifolius* Cav. 286
— *liniflorus* Willd. 287
— *linifolium* Willd. 286, 288
— *linosyris* (L.) Clairv. 175
— lonchophyllus Hook. 234
— *melanocephalus* Gombocz. 233
— *minjanensis* Rech. f. 275
— *mollissimus* Rech. f. and Köie. 271
— *myriocephalus* Rech. f. and Edelberg. 239
— nigromontanus Boiss. and Buhse. ..282
— nigromontanus M. Pop. 272
— obovatus (Benth.) Boiss. 269
— Oharaj (Nakai) Botsch. 216
— Olgae Rgl. and Schmalh. 270
— oligocephalus B. Fedtsch. 120
— oreades (Schrenk) Fisch. and Mey. 203, 236
— *oreades* auct. 202
— orientalis Boiss. 261, 262
— *paghmanicus* Rech. f. 276
— pallidus M. Pop. 225
— *paniculatum* Gilib. 239
— peregrinus (Pursh) Greene. 200
— petiolaris Vierh. 219, 220, 223, 229
— petroiketes Rech. f. 231
— plurifolius Botsch. 223, 583
— podolicus Bess. 249, 250
— — — β. *pusillus* Ldb. 234
— *politus* Fries. 251
— *polyadenus* Rech. f. and Köie. 271
— polymorphus Scop. 224
— Poncinsii (Franch.) Botsch. 275
— — — var. denudatus Botsch. 276
— Popovii Botsch. 235
— primuloides M. Pop. 268
— *pseudo-annuus* Makino. 245
— pseudelongatus Botsch. 264, 587
— pseuderigeron (Bge.) M. Pop. 267, 268, 282
— — — — ssp. *erectus* Novopokr. ...267
— — — — — — ser *serratifolus* Novopokr. 267
— — var. *filicaulis* Novopokr. 131
— — var. *oligocephalus* Novopokr. ...267
— pseuderiocephalus M. Pop. 237, 238, 262, 263, 265
— *pseudoneglectus* M. Pop. ...219, 223
— pseudoseravschanicus Botsch. 258, 259, 260, 585
— *psychrogeton* M. Pop. 277
— *pulchellus* DC. 210

Erigeron *pulchellus* DC. β. *unalaschkense* DC. 233
— Raddeanus Vierh. 192, 211
— *ramosus* Britt., Sterns and Pogg. 245
— Roylei DC. 285, 286
— *rupestris* M. Pop. 131, 268
— sachalinensis Botsch. 266
614 — *sanglichensis* Rech. f. and Edelberg. 276
— schalbusi Vierh. 225
— Schelkovnikovii Vierh. 192, 211
— Schmalhausenii M. Pop. 238, 262, 263, 164
— seravschanicus M. Pop. ..202, 203, 259
— silenifolius (Turcz.) Botsch. 212
— sogdianus M. Pop. 226
— *Stocksianum* Boiss. 120
— strigosus Mühl. ex Willd. 245
— Thunbergii A. Gray. 214
— tianschanicus Botsch. 259, 260
— trimorphopsis Botsch. 238, 584
— *turkestanicus* Hoffm. ex M. Pop. 277
— — O. Fedtsch. 231, 277
— — Vierh. 220, 230, 231
— umbrosus (Kar. and Kir.) Boiss. 285, 286
— *umbrosus* Buser ex Wendelbo. 285
— — M. Pop. 285
— *unalaschkensis* Vierh. 233
— uniflorus L. 227, 229, 230
— *uniflorus* auct. 228, 253
— — L. ssp. *eriocephalus* Cronq. 232
— — β. *oreades* Schrenk. 236
— uralensis Less. 248
— venustus Botsch. 210, 211
— — Botsch. var. glandulosos-hirsutus Vierh. 212
— venustus Botsch. var. typicus Vierh. 212
— vicarius Botsch. 204, 208
— violaceus M. Pop. 257, 258
— Woronowii Vierh. 192
Eschenbachia Moench. 191
— *ambigua* Moris. 287
Euambrosia Torr. and Gr., sect. 518
Euaster Kitamura, sect. 96
Euconyzastrum Botsch., sect. 280
Euerigeron (DC.) M. Pop., subgen. 200, 223, 238, 239, 261
Euevax DC., sect. 308, 314
Eugnaphalium DC., sect. 384, 394
Euhélichrysum Benth., subgen. 409
DC., sect. 409
DC., DC., sect. ser. II. *Chrysolepidea* § 1. *Stoechadina* DC. 409
Euinula Gren., sect. 443
Euinula Willk. and Lange, sect. 443
Euinuleae Benth., subtrib. 432
Eu-iva, sect. 515
Eulinosyris (Novopokr.) Kem.-Nat., sect......174
— Novopokr., sect. 174
Euorthomeris Torr. and Gray. ser. ...89
Eupatoriaceae Link. 16
Eupatorieae Cass., trib. 16
Eupatorium L. 18
— sp. 19
— cannabinum L. 19, 20
— — f. indivisum DC. 20
— *caucasicum* Stev. 19
— chinense ssp. *sachalinense* Kitam. ...21
— Glehnii Fr. Schmidt. 21
— *hyrcanicum* Stev. 19
— *japonicum* var. *sachalinense* Fr. Schm......21
— *Kirilovii* Turcz. 20
— Lindleyanum DC. 20
— *sachalinense* Makino. 21
— syriacum Jacq. 19
Eupulicaria Hoffm., sect. 488
Euthonia Ell., subgen. 50
Euxanthium DC., sect. 523
Evacella Smoljan., sect. 309
Evax Gaertn. 307, 314
— anatolica Boiss. and Heldr. 308
— arenaria Smoljan. 310
— contracta Boiss. 309
— filaginoides Kar. and Kir. 313, 314
— micropodioides Willk. 310, 313

Fastigiatae Novopokr., sect. 165
Filaginella Opiz. 381
— *nuda* Opiz. 392
— *lutea-alba* Opiz. 395
— *uliginosa* Opiz. 392
Filagininae O. Hoffm. subtrib. 300
Filaginoides Smoljan., sect. 313, 314
Filago L. 314, 342
— *acaulis* Krock. 402
— arvensis L. 322
— — var. laxa Lindem. 323
615 — — — ramosa Rouy. 322
— — — sylvestris Lindem. 323
— — — subsimplex Rouy. 323
— Bornmülleri Hausskn. 318
— eriocephala Guss. 317
— gallica L......325

Filago germanica L. 314, 316
—— var. canescens (Jord.) Gren. and Godr. 317
——— *eriocephala* Boiss. 317
——— *lanuginosa* DC. 317
———lutescens (Jord.) Gren. and Godr. 317
——— *spathulata* (Presl) DC. 321
— legopus Parl. 323
— *leontopodiodes* Willd. 349
— *leontopodium* L. 360
— minima (Sm.) Pers. 324
— montana L. 323
— *montana* L. 324
— spathulata Presl. 321
—— var. prostrata (Parlat.) Boiss. ...321
Francoeuria Cass. 487

Galatea Cass. 138
—*pauciflora* Cass. 162
—*punctata* (W. and K.) Cass. ...139, 155
Galatella Cass. 138
Galatella, sect. 143
— (Cass.) Benth. and Hook., sect. ...138
— *acutisquama* Novopokr. 155
— *acutisquamoides* Novopokr. ...155, 157
——ssp. *fastigiiformis* Novopokr. ...157
—— ssp. *montana* Novopokr. 157
— altaica Tzvel. 142, 144, 582
— angustissima (Tausch) Novopokr. ... .140, 167
—— var. *squamosa* (DC.) Novopokr. 166, 168
——— *tenuifolia* (Lindl.) Novopokr. 168
— *armena* auct. 161
—— var. *caucasica* Kem.-Nat. 161
—biflora (L.) Nees ab Esenb. ...141, 151
— *biflora* auct. 245
—— ssp. *bipunctata* (Novopokr.) Serg. 145
———*Kraschenninnikovii* Novopokr. 151
—— var. subglabra (Novopokr.) Serg. 153
— *bipunctata* Novopokr. 144, 145
— chromopappus Novopokr. ...142, 149
—— ssp. *villosula* Novopokr. 150
—— f. *discoides* Novopokr. 153
— coriacea Novopokr. 141, 156
— *crinitoides* Novopokr. 168
— dahurica DC. 139, 142, 143
— *densiflora* (Ave-Lallem.) Novopokr. 155
Galatella *desertorum* (Less.) Kar. and Kir. 167
— divaricata (Fisch. ex M.B.) Novopokr 140, 171
—— f. *discoidea* (Schultz Bip.) Novopokr. 172
———*radiata* (Trautv.) Novopokr. .172
— dracunculoides (Lam.) Nees ab Esenb. 142, 162
—— var. *discoidea* DC. 151
———*falcata* Kem.-Nat. 163
——— *iberica* Kem.-Nat. 163
——— *latifolia* Kem.-Nat. 163
——— *Pastuchovii* Kem.-Nat. 159
——— *Schelkovnikovii* Kem.-Nat. ...163
——— *Troitzkyi* Kem.-Nat. 163
— eldarica Kem.-Nat. 142, 160
—*fastigiata* Lehm. ex Nees. 166
616 —— var. *tenuifolia* (Lindl.) Novopokr. 167
— fastigiiformis Novopokr. 143, 157
—*glabra* Novopokr. 152
—*Hauptii* var. *grandiflora* Avé-Lallem. 140, 166
———*squamosa* (DC.) Avé-Lallem. 166
———*tenuifolia* (Lindl.) Avé-Lallem. 167
— hissarica Novopokr. 142, 158
— *iberica* Kem.-Nat. 162
—*Kraschenninnikovii* Novopokr. 151
— *Ledebouriana* Novopokr. 155
— *leptophylla* (Desf.) Nees ab Esenb. 171
—*linosyris* (L.) Rchb. fil. 175
—— ssp. *pontica* (Lipsky) Novopokr. and Bogdan. 177
— Litvinovii Novopokr. 142, 158
— macrosciadia Gandog. 142, 145
—*Meyendorfii* Rgl. and Maack. 72
—*Novopokrovskii* Zefir. 151, 152
— *obtusifolia* Novopokr. 157
—*pallescens* Novopokr. 151
— Pastuchovii (Kem.-Nat.) Tzvel. 143, 159
— polygaloides Novopokr. 140, 165
— *pontica* (Lipsky) Novopokr. and Bogdan.......................................177
—*punctata* (W. and K.) Nees ab Esenb. 139, 142, 154
—*punctata* auct. 145
—— ssp. *baschkirica* Novopokr. ...154
——— *densiflora* (Avé-Lallem.) Novopokr. 154

Galatella *punctata* ssp. *rossica* Novopokr. 155
—— var. *densiflora* Avé-Lallem. 154
— punctata var. *discoidea* Avé-Lallem. 151
———— *minor* Ldb. 179
——— *dracunculoides* (Lam.) Avé-Lallem. 162 617
——— *Lallemantii* Novopokr. 159
— *rigidula* Novopokr. ex Zefir. 141, 153, 151
— *rossica* Novopokr. 155, 156
— — ssp. *densiflora* (Avé-Lallem.) Novopokr. 155
— saxatilis (M. Pop. ex Novopokr.) Novopokr. 139, 163
— scoparia (Kar. and Kir.) Novopokr. 140, 172
— *songorica* Novopokr. 145, 149
— Sosnovskyana Kem.-Nat. 141, 161
— *squamosa* DC. 166
— *strigosa* Weinm. 66, 154
— *subglabra* Novopokr. 153
— *tarbagatensis* Novopokr. 145
— *tatarica* (Less.) Novopokr. 179
— *tenuifolia* Lindl. 167
— tianschanica Novopokr. 140, 164
— trinervifolia (Less.) Novopokr. 141, 154
— villosula Novopokr. 141, 150
— *villosa* (L.) Rchb. fil. 178
Galinsoga Ruiz and Pav. 563
— hispida Benth. 564
— parvifolora Cav. 563
—— γ *hispida* DC. 564
— quadriradiata Ruiz and Pav. 563
— *quinqueradiata* Ruiz and Pav. 564
Galinsogaea Zucc. 563
Galinsoginae O. Hoff., subtrib. 562
Gamochaeta Wedd. 397
— *norvegica* Gren. 399
— *silvatica* (L.) Wedd. 397
Gelasia desertorum Less. 167
Genuini Nees, sect. 83
Georgina bipinnata Spreng. 562
— *variabilis* Willd. 548
Gifola (Cass.) DC., sect. 316
Gifola Cass. 314, 316
— *germanica* Sacc. 316
Gnaphalieae, trib. 347
Gnaphalinae Rchb., subtrib. 326
Gnaphalium L. 377, 381, 384
Gnaphalium L. 342, 404
Gnaphalium subgen. 384
— sect. 384
— *acaule* Sieb. ex Fisch. and Mey. ...402
— *affine* D. Don. 396
— *alpigenum* C. Koch. 402
— *alpinum* L. 336
— *aquaticum* Mill. 392
— *arenarium* L. 410
— *armenium* Fisch. and Mey. 423
— *arvense* Willd. 322
— *aureum* Gilib. 410
— baicalense Kirp. 386, 394
— *callichrysum* Fisch. and Mey. 424
— *candidissimum* M.B. 431
— carpaticum Wahlenb. 339
—— auct. 340
— *castaneum* Gilib. 392
— *caucasicum* Leskov ex Grossh. ...401
— caucasicum Somm. and Lév. 401
— *confusum* DC. 396
— *conglobatum* Lam. 395
— *dioicum* L. 329
— *elichrysum* Pall. 410
— *fuscatum* Pers. 399
— *fuscum* Lam. 399
—— Scop. 402
— subgen. *Gamochaeta* Gren. 397
— sect. *Gamochaeta* (Wedd.) O. Hoffm. 397
— *graveolens* Henning. 410
—— M.B. 421
— *Hoffeanum* C. Koch. 404
— kasachstanicum Kirp. 391
— *laevissimum* Schur. 392
— lagopus Steph. 323
— *lavandulaefolium* Willd. 429
— *leontopodioides* Willd. 349
— *leontopodium* L. 360
—— f. *alpina genuina* Herder. 354
——— *alpina multiflora* Herder. 356
——— *alpina pygamaea* Herder. 348, 350
——— *sibirica depauperata* Herder. 348
——— *sibirica genuina* Herder. 349, 354
——— *sibirica gracilis* Herder. 349
——— *sibirica humilis* Herder. 349, 354, 356
—— α. campestre Ldb. 354
—— β. sibirica Franchet. 349
—— β. subalpinum Ldb. 350
— luteo-album L. 395

Gnaphalium luteo-album L ssp. *affine* Koster. 396
———— var. *multiceps* (Wall. ex. DC.) Hook. f. 396
— mandshurica Kirp. 385
— *margaritaceum* L. 365
— *minimum* Smith. 324
— *monanthon* Willd. 428
— *montanum* Willd. 323
— *multiceps* Wall. ex DC. 396
— *muscoides* Desf. 378
— norvegicum Gunn. 399
— *norvegicum* auct. 397, 401
—— ssp. *chamarense* Sukacz. 399
— *nudum* Hoffm. 392
— *Pallasii* Spreng. 334, 428
— *pilulare* Wahlenb. 392
—— β. *humifusum* Paill. 392
—— β. *nudum* DC. 392
— *plicatum* Fisch. and Mey. 419
— *racemosum* Boguslav. 397
— *ramosum* Lam. 392
— *rectum* Sm. 397
— rossicum Kirp. 389
— sibiricum Kirp. 390, 394
— silvaticum L. —cfr. G. sylvaticum L.
— *spadiceum* Gilib. 397
— *Stoechas* auct. 410
— *strictum* Moench. 399
— *subalpinum* Neilr. 399
— supinum L. 402, 403
—— var. *typicum* Trautv. 402
—— β. *subacaule* Wahlenb. 402
— tomentosum Hoffm. 392
—— Luce. 392
618 — sylvaticum L. 397
—— var. *norvegicum* (Gunn.) B. Fedtsch. and Fler. 399
—— α. *brachystachyum* Ldb. 399
—— α. *brachystachys* Ldb. 399
—— α. *montanum* Neirl. 397
—— α. *rectum* DC. 397
—— β. *abbreviatum* Kauffm. 397
—— β. *fuscatum* Wahlenb. 399
—— β. *macrostachys* Ldb. 397
—— β. *macrostachyum* Ldb. 397
—— β. *stramenticum* Beck. 397
—— f. *virgatum* Kitt. 397
— Tranzscheli Kirp. 384, 394
— uliginosum L. 391
— *uliginosum* L. p. p. 384, 385, 386, 389, 390, 391
— uliginosum L. s. l. 394
——— s. str. 393, 394

Gnaphalium *uliginosum* auct. 384, 385, 386, 390, 391
—— var. *pilulare* Wahlenb. 392
—— α. *leiocarpum* Ldb. 386, 390
—— α. *pseudo-pilulare* Abrom. ex Scholz. 392
—— β. *laxiocarpum* Ldb. 384, 385, 386, 390, 391, 392
—— β. *pilulare* Koch. 392
—— γ. *glabrum* Koch. 392
—— a. *stricta* Sukacz. 389
—— b. *pumilc* Sukacz. 389
—— c. *ramosa* Sukacz. 389
—— d. *intermedia* Sukacz. 389
—— 1 *erectum* Gruner. 389
—— 2 *ramosissimum* Gruner. 389
—— 3 *prostratum* Gruner. 389
— *uniflorum* Habliz. 428
—— Mill. 428
—— Pall. 428
Grangaea latifolia Lam. ex Poir. 51
Grangeinae O. Hoffm., subtrib. 51
Grindelia Willd. 30
— *incisa* Spreng. 123
— *squarrosa* (Pursh.) Dumal. 30
Guixotia Cass. 545
— abyssinica (L. f.) Cass. 545
— *oleifera* DC. 545
Gymnaster Kitamura. 58
— Savatieri (Makino) Kitamura. 58

Helenieae Cass., trib. 569
Helenioideae Benth., trib. 569
Helenium grandiflorum Gilib. 440
Heliantheae Cass., trib. 529
— subtrib. *Ambrosinae* O. Hoffm. ...512
Helianthoideae Benth. p. p., trib. ..529
— subtrib. *Ambrosieae* Benth. 512
Helianthus L. 541
— annuus L. 541, 542, 543
— argophyllus Torr. and Gr. 541
— atrirubens L. 542, 544, 545
— cucumerifolius Torr and Gr. 542
— *cultus* Wenzl. 542, 543
—— ssp. *ornamentalis*, Grex *ramosissimus* Wenzl. 543
— decapetalus L. 541
— *esculentus* Warcz. 544
— *macrospermus* Platsch. 544
— Maximiliani Schrad. 541
— *multiflorus* Hook. 542
— *oleiferus* Platsch. 544
— *platycephalus* Cass. 542
— *ruderalis* Wenzl. 542, 543

Helianthus *serotinus* Tausch 544
619 — *silphioides* Nutt. 544
— tuberosus L. 541, 544
Helichrysum Mill. corr. Pers. 405
Helichrysum, subgen. 409
— sect. 409
— *anatolicum* Boiss. 419
— — var. *elatius* Herd. 420
— *angustifolium* DC. 430
— *aqüaticum* Rupr. 392
— araxinum Takht. ex Kirp. 424
— arenarium (L.) Moench. 410, 422
— arenarium (L.) DC. 410
— — var. *armenium* O. Ktze. 423
— — — *nodosum* O. Ktze. 415
— — — *roseum* Trautv. 410, 412
——— *turkestanicum* Rgl. and Schmalh. 416
——— α. *congestum* Lindem. 410
——— α. *subulosum* Gruner. 410
— — β. *aurantiacum* DC. 412
— — β. aurantiacum Pers. 410
— — β. *campestre* Gruner. 410
— — 1. *elatius* Gruner. 410
— — 2. *latifolium* Gruner. 410
— — β. *laxe-corymbosum* Lindem. .410
— — β. *prostratum* Ldb. 410
— — β. *stenophyllum* Boiss. 412
— — β. *undulatum* C. Koch. 412
— — γ. *pallidum* Lindem. 410
— — γ. *plinthocalyx* C. Koch. 412
— — δ. *kokanicum* Rgl. and Schmalh. 416, 417
— — × H. graveolens (M.B.) Sweet..422
— *armeniacum* DC. 423
— armenium (Fisch. and Mey.) DC ...422
— — f. eglandulosum Kirp. 423
— — — glandulosum Kirp. 423
— — — subglandulosum Kirp. 423
— — β. *lacteum* Boiss. 423
— auranticum Boiss. and Huet ex Boiss. 429
— *Aucheri* Boiss. 428
— *azerbajdzanicum* Sosn. ex Grossh. 412
— bracteatum (Vent.) Willd. 406
— *buchtormense* DC. 410
— *Buhseanum* Boiss. 430
— *Buhseanum* auct. 372, 374
— *Buschii* Juz. 422
— callichrysum (Fisch. and Mey.) DC. 424, 428, 429
— *candidissimum* Benth. and Hook. ..431
— *chionophyllum* Boiss. and Bal. 428
Helichrysum *citrinum* Boiss. 430
— *commixtum* C. Koch. 430
— *compactum* Boiss. 430
— *corymbiforme* Opperm. ex Katina. 410
— *corymbiformis* Opperm. 410
— *glanduliferum* Sch. Bip. 423
— *glandulosum* Ldb. 423
— graveolens (M.B.) Sweet. ...419, 421
— *graveolens* (M.B.) DC. 421
— *kokanicum* Krasch. and Gontsch. ...416
— — f. *depauperata* Krasch. 416
620 — kopetdagense Kirp. 415
— *lanatum* DC. 430
— *lavandulaefolium* Boiss. 429
— — DC. 429
— — D. Don. 429
— — auct. 429
— — Willd. γ. *rubicundum* C.Koch. 412
— *luteo-album* Rchb. 395
— maracandicum M. Pop. ex Kirp. 420
— *margaritaceum* Moench. 365
— *Mussae* Nevski. 417, 421
— nuratavicum Krasch. 417
— orientale Gaertn. 405, 430
— *Pallasii* Ldb. 424
— — (Spreng.) Boiss. 427, 428
— — (Spreng.) Boiss. γ. psychrophilum Boiss. 428
— Pallasii (Spreng.) Ldb. 428
— plicatum (Fisch. and Mey.) DC. ..419
— plicatum var. *citrinum* Trautv. ...419
— — — *eglandulosum* Medw. 419
— — — β. *lacteum* Boiss. 419
— *plicatum* auct. 420
— *plinthocalyx* (C. Koch) Sosn. 412
— — δ. *aurantiacum* Sosn. 412
— *pluriceps* Grossh. 412
— — C. Koch. 412
— polylepis Bordz. ex Grossh. 427
— polyphyllum Ldb. 418
— *psychrophilum* Boiss. 428
— *rubicundum* (C. Koch.) Grossh. ..412
— *Sosnovskyi* Grossh. 412
— — f. *croceum* Grossh. 412
— — f. *rubrum* Grossh. 412
— *tanaiticum* P. Smirn. 410
— *Tardentii* Boiss. 423
— *tchabanicum* C. Koch. 430
— tianschanicum Rgl. 415, 416, 421
— — var. aureum O. and B. Fedtsch. 416
— — var. *Mussae* Winkl. 417

Helichrysum tianschanicum var. *stenophyllum* Winkl. 417
— — depauperatum (Krasch.) Kirp. ...416
— *tianschanicum* auct. 420
— undulatum Ldb. 412
Heliposis Pers. 535
— *helianthoides* var. *scabra* (Dun.) Fernald. 535
— scabra Dun. 535
Heterochaeta DC. 191
— *leucophylla* Bge. 273
— *Pseudo-erigeron* Bge. 267
Heterochromeae Benth., subtrib. 54
Heteropappus Less. 61
—Alberti (Rgl.) Novopokr. and Tamamsch. 67
— altaicus (Willd.) Novopokr. ..66, 69
— — var. *hirsutus* Novopokr. 68
— canescens (Nees) Novopokr. ...67, 69
— decipiens Maxim. 69
— distortus (Turcz.) Tamamsch. 66
— elisabethinus Tamamsch. 70, 578
— hispidus (Thunb.) Less. 69
— — var. *disciflorus* Kom. 69
— — — *heterochaeta* Franch. 69
— — — longeraditus Kom. 72
— — — *tubulosus* Kitamura. 69
— *incisus* Sieb. and Zucc. 69
— *Krylovianus* Kom. 216
— medius (Kryl.) Tamamsch. 68
— Meyendorfii (Rgl. and Maack) Kom. and Alis. 72
— noneifolius Tamamsch. 71, 578
— *Oharai* Kitamura. 216
621 — pinetorum Kom. 69
— saxomarinus Kom. 70
— *sibiricus* Kom. 71
— tataricus (Lindl.) Tamamsch. 69, 71, 190, 191
Himalayanae Clarke, sect. 364, 365, 373, 586
Hisutsua DC. 122
Homalotheca Endl., subgen. 402

Inula L. 433
— acaulis Schott and Kotschy. 471
— *Albertoregelia* (Winkl.) B. Fedtsch. 479
— *alpina* Adams. 444
— *ammophila* Bge. 476
— — β. salsoloides Bge. 476
— aspera Poir. 452, 454
— auriculata Boiss. and Bal. 462
— britannica L. 465
Inula britannica subsp. *japonica* Kitam. 471
— — — — — — var. *ramosa* Kitam. ...471
— — subsp. linariaefolia Kitam. 468
— — var. *chinensis* Rgl. 468
— — — *japonica* Miq. 471
— — — *linariaefolia* (Turcz.) Rgl. 468
— — — *Maximoviczii* Rgl. 468
— — — *ramosa* Kom. 471
— — — setosa Krasch. 466
— — — stepposa Serg. 466
— — — *tymiensis* Kudo. 465
— — — *vulgaris* Beck. 467
— — α. sublanata Kom. 466
— — β. angustifolia Beck. 466
— — γ. ramosissima Ldb. 466
— *bubonium* M. B. 452
— — Jacq. 452
— *campestris* Bess. 461
— *caspica* Ldb. 460
— caspica Blum. 460
— *caucasica* Pers. 510
— *chinensis* Rupr. 468
— *comosa* Lam. 465
— *conyza* DC. 473
— *cordata* Pacz. 453
— — auct. 452
— *crithmoides* Spreng. 476
— decurrens M. Pop. 475
— *dentata* Sibth. and Sm. 491
— *divaricata* (Cass.) Boiss. 480
— *dubia* Thunb. 215
— *dysenterica* Georgi. 465
— — L. 490
— — (L.) Gaertn. var. *taurica* M.B. ...492
— ensifolia L. 449
— *fasciculata* Gilib. 451
— *flexuosa* auct. 479
— germanica L. 451
— — α. *normalis* Beck. 451
— — β. *latifolia* Schur. 451
— — γ. *caucasica* Beck.....................451
— — I. *ensifolia* L. × 452
— — I. *salicina* L. 452
— *glabra* Gilib. 454
— *glandulosa* Adams. 447
— — Willd. 447
— glauca Winkl. 458
— — — — var. badachschanica Rubtz. ..464
— *gnaphalodes* Vent. 496
— grandiflora Willd. 444
— — var. *glandulosa* (Willd.) Parsa. 447
— grandis Schrenk. 441

Inula Grombczewskii Winkl. 463
— helenium L. 440
— *hirsuta* Güldanst. 448
— hirta L. 448
— — — × I. *salicina* L. 456
— *hybrida* Baumg. 450, 452
— *involucrata* Kalenicz. 448
— — Miq. 456
— japonica Thunb. 468
— Kitamurana Tatew. 456
— *lanuginosa* Gilib. 461
— linariifolia Turcz. 468
— macrolepis Bge. 467
— *macrophylla* Kar. and Kir. 441
— magnifica Lipsky. 442, 443
— Mariae Bordz. 457
— *media* M.B. 451, 452
— *melanolepidea* Kalenicz. 448
— *micranthos* Poir. 451
— *montana* M.B. 461
— Montbretiana DC. 457
— multicaulis Fisch. and Mey. 435, 475
— oculus-Christi L. 461
622 — orientalis Lam. 447
— *orientalis* Beck. 444
— — Willd. 451
— *prostrata* Gilib. 489
— *pseudoconyza* Alb. 473
— *Pulicaria* L. 489
— *repanda* Turcz. 465
— rhizocephala Schrenk. 472
— Rubtzovii Gorschk. 464
— sabuletorum Czern. 453
— salicina L. 454
— — subsp. *asiatica* (Kitam.) Kitag. ... .456
— — var. *asiatica* Kitam. 456
— — — *genuina* Fr. and Sav. 456
— — — *latifolia* DC. 452
— — — *latifolia* Fr. and Sav. 456
— — β. *aspera* (Poir) Beck. 452
— — 1. *latifolia* Beck. 452
— — 2. *angustifolia* Beck. 452
— salsoloides (Turcz.) Ostf. ...435, 476
— *Schischkinii* Gorschk. 464
— Schmalhausenii Winkl. 459
— *Schmalhausenii* Pacz. 453
— *schugnanica* Krasch. 464
— — Winkl. 476
— Seidlitzii Boiss. 448
— *serrata* Gilib. 465
— *spiraeifolia* C. Koch. 452
— *squarrosa* Griseb. 452
— — Ldb. 452
Inula *suaveolens* Pall. 461
— *subhirta* C.A.M. 456
— thapsoides (Willd.) DC. 474
— *Thompsonii* Botsch. and Lipsch. 463, 464
— *tymiensis* Kudo. 465
— vulgaris (Lam.) Trevisan. 473
Inuleae Cass., trib. 290
Inulinae O. Hoffm., subtrib. 432
Inuloideae Benth., trib. 290
Inulotypus Dumort., sect. 443
Iphiona Cass. 486
— *perisca* (DC.) Benth. and Hook. ..486
— *radiata* Benth. 476
Iva L. 515
— xanthifolia Nutt. 515
Iveae Rydb., trib. 514

Kalimeris Cass. 122
Kalimeris Cass. 124
— incisa (Fisch.) DC. 123
— integrifolia Turcz. 123
— *platycephala* Cass. 123
Karelinia Less. 295, 297
— caspia (Pall.) Less. 296, 297
— — f. angustifolia Smoljan. 297
— — — ovatifolia Smoljan. 297
Kemulariella Tamamsch. ...110, 111, 580
— abchasica (Kem.-Nat.) Tamamsch. 116
— Albovii Tamamsch. 117, 581
— caucasica (Willd.) Tamamsch. 112
— — var. alpestris Kem.-Nat. 115
— — — angustifolia Kem.-Nat. 115
— — — canescens Kem.-Nat. 115
— — — ovalifolia Kem.-Nat. 115
— — — pleiocephala Boiss. 115
— — f. brittatica Tamamsch. 115
— colchica (Alb.) Tamamsch. 117
— rosea (Stev.) Tamamsch. 115, 116
— Tugana (Alb.) Tamamsch. 116
Krylovia Schischk. 129
— eremophila (Bge.) Schischk. 132
— limoniifolia (Less.) Schischk. 130
— Novopokrovskyi (Krasch. and Iljin) Tamamsch. 135
— Popovii (Botsch.) Tamamsch. 131
— — var. zeravschanica Tamamsch. ..131

Lachnophyllum Bge. 288
— gossypinum Bge. 288
Lacinaria Hill. 23
Lasiocarpae Boiss. 456

Lasiopogon Cass. 377
— muscoides (Desf.) DC. 377
Laya Hook. and Arn. 568
— calliglossa (Fisch. and Mey.) Gray. 569
— Douglasii (Hook and Arn.) Gray. ...569
— elegans Torr. and Gr. 568
623 Laua glandulosa Hook. and Arn. 569
— platyglossa (Fisch. and Mey.) Gray. 569
Layia Hook. and Arn. 568
Leiocarpae Boiss. 444
Leontopodium R. Br. 342, 354
— *alpinum* Cass. 344, 360
— *alpinum* auct. ..350, 354, 355, 358, 359
— — ssp. *alpinum* var. *conglobatum* Beauv. 356
——— *campestre* var. *altaicum* Beauv. 354, 356
———— *campestre* Beauv. 354
———— *conglobatum* Beauv. 356
— — — — — *depauperatum* Beauv. 349
———— *monocephalum* Beauv. 359
——— *subalpinum* var. *debile* Beauv. 350
———— *Hedinianum* Beauv. 350
———— *subalpinum* Beauv. 350
—— var. *campestre* f. *gracile* Beauv ... .349
——— *conglobatum* Beauv. 356
——— *polyphyllum* Beauv. 358
——— *sibiricum* O. Fedtsch. 350
——— *subalpinum* Ldb. 350
— — — — f. *monocephalum* Beauv. 359
—— f. *sibirica* Korsh. 356
—— α. *campestre* Ldb. 354, 355, 359
—— β. *sibirica* Rgl. and Til. 348
— *antennarioides* Soczava. 348
— brachyactis Gdgr. 344, 358, 359
— *caespitosum* Beauv. 358
— *campestre* Hand.-Mazz. 354
—— auct. 353
— *conglobatum* Hand.-Mazz. 356
— *coreanum* Nakai. 346, 348
— discolor Beauv. ...344, 346, 347, 349
— *Fedtschenkoanum* Beauv. 354
— *Fischerianum* Beauv. 350
— himalayanum DC. 354
— *Jamesonii* Hand.-Mazz. 359
— × — Beauv. 359
— japonicum Miq. 346, 347
Leontopodium japonicum ssp. *sachalinense* Takeda. 346
— *Juzepczukii* Karav. 348
— *kamtschaticum* Kom. 348
— kurilense Takeda. 344, 348
— *leontopodinum* Hand.-Mazz. 350, 353
— leontopodioides (Willd.) Beauv. 343, 349, 350, 354
— *linearifolium* Hand.-Mazz. 348
— *margelanense* Beauv. 358
— *monocephalum* Klatt. 359
— nanum (Hook. f. and Thoms.) Hand.- Mazz. 343, 354, 358, 359
— ochroleucum Beauv. 345, 346, 350, 354, 357, 358, 359, 360
—— Beauv. var. campester (Ldb.) Grub. 345, 350, 354, 357, 358
—— var. conglobatum (Turcz.) Grub. 345, 350, 355, 357, 358
—— Beauv. f. pygmaeae Grub. 353, 354
— Palibinianum Beauv. 344, 345, 346
—— Hand.-Mazz. 356
— *sachalinense* Miyabe and Kudo. 346, 347
— *sibiricum* Cass. 349
—— auct. 346, 356
—— var. *conglobatum* Turcz. 346
624 —— α. *humile* Turcz. 349
—— β. *gracile* Turcz. 349
——— Maxim. 349
—— γ. *depauperatum* Turcz. 349
——— Maxim. 349
— *tataricum* Kom. 346
Lepicline Cass. 395
Leptilon Raf. 191
— *bonariense* Small. 240
— *canadensis* Britton. 239
— *linifolium* Small. 287
Liatris Schreb. 23
— *macrostachya* Mich. 23
— *sessiliflora* Bertol. 23
— spicata (L.) Willd. 23
Limbardia Adans. 433
Linosyris Cass. 173
Linosyris (Cass.) Rchb., subgen. 173
Linosyris, sect. 174
Linosyris (Cass.) Hoffm., sect. 173
— *Capusii* Franchet. 181
— *divaricata* (Fisch. ex M.B.) DC. ..171
—— var. *discoidea* (Schultz Bip.) Serg. 172
——— *radiata* Trautv. 172

Linosyris Fominii Kem.-Nat. ...174, 176
— *glabrata* (Lindl.) DC. 179
— *Grimmii* Rgl. and Schmalh. 181
— — var. *macrostyla* Rgl. and Schmalh.
....181
— *pontica* (Lipsky) Novopokr. ...174, 177
— *punctata* (Moench) DC. 151, 179
— — Rgl. and Schmalh. 154
— *scoparia* Kar. and Kir. 172
— *tarbogatensis* C. Koch. 179
— tatarica (Less.) C.A.M. 174, 179
— — var. *macilenta* Kar. and Kir. ...180
— — — *scabra* Kar. and Kir. 180
— villosa (L.) DC. 174, 178
— — var. *angustifolia* Kem.-Nat. ...179
— — — *grandiflora* C. Koch. 179
— — — *nana* Kem.-Nat. 179
— — — *ramosa* Kem.-Nat. 179
— vulgaris Cass. ex Less. 173, 175
— — var. *hemisphaerica* Kem.-Nat. ...176
— — var. *ponitica* Lipsky. 177
Logfia Cass. 314, 325
Logfia Boiss., sect. 325
— *subulata* Cass. 325
Longeligulatae Beck, subsect. 444
Longisquamatae Botsch., sect. 266

Macroglossae Vierh., sect. 252
Madia Mol. 567
— *capitata* Nutt. 567
— mellosa Molina. 567
— *racemosa* Torr. and Gray. 567
— sativa Mol. 567
— *viscosa* Cav. 567
Madinae O. Hoffm. 567
Margaripes DC., sect. 365
Martinia Vaniot. 122
Mastigopus Novopokr., sect. 165
Melampodinae O. Hoffm., subtrib. ...530
Micropus L. 300, 302
— sect. *Bombycilaena* DC. 301, 302
— *erectus* L. 302
— *longifolius* Boiss. and Reut. 306
— supinsu L. 300, 302
Molpadia suaveolens Cass. 510
Myriactis Less. 52
— Gmelini (Fisch. and Mey.) DC. 52

Oegophthalmus Benth., sect. 471
Oglifa (Cass.) DC., sect. 321
Oglifa Cass. 314, 321
— *minima* Rchb. 324
Olygotrichium Nutt., sect. 244

Omalotheca Cass. 402
Omalotheca Endl., subgen. 402
— *Einseliana* Schultz fr. 398
— subgen. *Euomalotheca* Schultz fr.
....402
— — Gamochaetiopsis Schultz fr. ...397
— *norvegica* Schultz fr. 399, 400
— *supina* Cass. 402
— — β. *subacanulis* DC. 402
— *sylvatica* Schultz fr. 398
Oreophilon Novopokr., sect. 164
Oritrophium Torr. and Gray. 104
Orthorryncha Wallroth, subsect. 523

Pallenis Cass. 508
— spinosa (L.) Cass. 508
Paniculatae A. Gray, sect. 48
Parthenium L. 530
— argentatum Gray. 530, 532
625 Peninsulares Clarke, sect. 365, 373
Pentanema Cass. 477
Pentanema Boiss., sect. 477
— Albertoregelia (Winkl.) Gorschk. ...479
— divaricatum Cass. 478, 480
— glanduligerum (Krasch.) Gorschk.
....485
— parietarioides (Nevski) Gorschk. 484
— propinquum (Nevski) Gorschk. ...484
— rupicola (Krasch.) Gorschk. 483
Phagnalon Cass., gen. 379
— Androssovii B. Fedtsch. 379, 380
— darvazicum Krasch. 379
— *glaberrimum* Rech. f. 379
— *rupestre* (L.) DC. 380
Phalacroloma Cass. 191
Phalacroloma (Cass.) Torr. and Gray,
sect. 191, 243, 244
— *acutifolium* Cass. 244
— *Beyrichtii* Fisch. and Mey. 245
Pilosanthus Neck. 23
Platychaeta Boiss. 487
Platyglossa Botsch., sect. 200, 211
Pluchea caspia (Pall.) O. Hoffm. ex
Paulsen. 296
Plucheinae Rchb., subtrib. 295
Polycephalos Boiss., sect. 365, 586
Polymnia abyssinica L. 545
Polypappus Less. 297
Pseudevax DC., sect. 310
Pseudoaster Tamamsch., sect. 68
Pseudocalimeris Tamamsch., sect. ...66
Pseudo-Conyza Cosson and Germ.,
subgen. and. 473
— — Gren., sect. 443

Pseudolinosyris Novopokr. 180 626
— *Capusii* Novopokr. 181, 183
— — var. microcephala Novopokr. ...182
— Grimmii (Rgl. and Schmalh.) Novopokr. 181
— — var. *glandulosa* Novopokr. 181
— — — *eglandulosa* Novopokr. 181
— microcephala (Novopokr.) Tamamsch. 182
— Sintenisii (Bornm.) Tamamsch. 183
Psychrogeton Boiss. 191
Psychrogeton (Boiss.) Botsch., sect. ...267
— *Alexeenkoi* Krasch. 271
— *andryaloides* Novopokr. ex Krasch. 274, 275
— *cabulicum* Boiss. 277
— *Capusi* Novopokr. 131, 267, 268
— *chionophilum* Krasch. 269, 275
— *leucophyllum* Novopokr. 273
— *Olgae* Novopokr. ex Nevski. 270
— *pseuderigeron* Novopokr. ex Nevski. 267
— *turkestanicum* Hoffm. 277
Pterochaeta Boiss. 487
Pulicaria Gaertn. 487
— dysenterica (L.) Gaertn. 490
— — var. *uliginosa* Hohenack. 491
— — — β. *microcephala* Boiss. 491, 492
— — — β. *uliginosa* Schmalh. 491
— — — γ. *stenophylla* Boiss. 491, 492
— *elata* Boiss. 491
— *elatior* Boiss. 492
— *germanica* Presl. 451
— gnaphalodes (Vent.) Boiss. 496
— gracilis Heimerl. 490, 495
— *hirta* Presl. 448
— prostrata (Gilib.) Aschers. 489
— — — var. villosa Hohenack. 489
— salviifolia Bge. 495
— — — var. canescens Winkl. 495
— — — — glabrescens Winkl. 495
— salviifolia Bge. var. lachnophylla Winkl. 495
— uliginosa Stev. 491
— — — var. stenophylla (Boiss.) Goulbk. 492
— *undulata* Meyer. 489
— *vulgaris* Gaertn. 489

Ramtilia oleifera DC. 545
Rhinactina Less. 129
— *limoniifolia* Less.........................130
Rhinactina Novopokrovskyi Krasch. and Iljin. 135
— *uniflora* Bge. ex DC. 132
Rhinactinidia Novopokr. 129
Rudbeckia L. 539
— hirta L. 539
— laciniata L. 540
— *purpurea* L. 541

Sanvitalia Gualt. 534
— procumbens Lam. 534
— *villosa* Cav. 534
Schizogyne Cass. 433
Senecioneae subtrib. *Ambrosieae* Less. p. p. 512
Senecionideae Less., trib. 290
— subtrib. *Ambrosieae* Less. 512
— — *Melampodineae* div. *Ambrosieae* and *Iveae* DC. 512
Serratula caspica Pall. 296
Siegesbeckia L. 536
— *caspica* Fisch. and Mey. 536, 537
— *iberica* Willd. 536
— orientalis L. 536
— orientalis var. caspica (Fisch. and Mey.) Grossh. 537
— — — subeglandulosa Boiss. 537
Simlera Bubani. 342
— *alpina* Bubani. 360
Siphonoglossa Botsch., sect. 211, 219, 223
Solidagininae O. Hoffm., subtrib. 30
Solidago L. 31
— alpestris Waldst. and Kit. 39, 44
— alpestris auct. 40
— *arctica* V. Vass. 47
— arguta Ait. 49
— armena Kem.-Nat. ex Grossh. 41
— *armena* var. *compacta* Kem.-Nat. 41
— — *laxa* Kem.-Nat. 41
— canadensis L. 48
— *capitata* Fisch. 47
— *caucasica* Kem.-Nat. 40, 44
— *compacta* Turcz. 47
— *confertiflora* Ldb. 47
— cuprea Juz. 46, 577
— dahurica Kitag. 42, 43, 44
— — — f. *foliosa*. 43
— — — — *genuina*. 43
— *flexuosa* Gilib. 34
— Gebleri Juz. 43, 576
— graminifolia (L.) Ell. 50
— jailarum Juz. 39, 575
— juncea Ait. 50

Solidago kuhistanica M. Pop. ...44, 576
— kurilensis Juz. 45, 577
— lapponica Wither. 41, 42, 46
— *leiocarpa* V. Vassil. 46
— *multiradiata* var. *arctica* Femald. ...47
— — A. Gray. 47
— neglecta Torr. and Gr. 49
— odora Ait. 50
— pacifica Juz. 43, 44
— *pumila* C.A.M. 43
— — Pers. 39
— rupestris Raf. 49
— serotina Ait. 48
— *sibirica* Fisch. 42
— spiraeifolia Fisch. 45, 46
— tuarica Juz. 35, 36, 39, 575
— turfosa Woron. 35, 36
— *unalaschensis* Gandog. 47
— virgaaurea auct. 44
— *virgaaurea* var. *arctica* Fellm. 41
— *virga aurea* Kom. 46
— — — Schmalh. 34, 39
— — — var. *alpestris* DC. 39
— — — — — Kryl. 43
— — — — *beringensis* V. Vass. 46
— virgaaurea L. 34, 36, 39, 42, 43, 44, 45, 46
— *virga aurea* L. 41
— — — Less. 47
— — — auct. 39, 44
— — — ssp. *alpestris* var. pumila Gaud. 40
— — — — *dahurica* Kitag. 42
— — — ssp. *lapponica* C. Rgl. 41
— — — var. *alpestris* Beck. 40
— — — — — — Simmons. 41
— — — — — — auct. 40
— — — — *angustifolia* C. Koch. 34
627 — — — — *condensata* Kem.-Nat. 34
— — — — *coreana* Nakai. 44
— — — — *dahurica* Kitag. 42
— — — — leiocarpa A. Gray. 45
— — — — *leiocarpa* Hulten. 46
— — — — — — Nakai. 44
— — — — *maxima* C. Koch. 34
— — — — *minima* Simmons. 41
———— *obtusissima* Kem.-Nat. ex Grossh. 34
— — — — *vulgaris* DC. 34
— — — — — — f. *genuina* Fiori. 34
— — — — — — — — *foliosa* Fiori. 34
— — — f. angustifolia C. Koch. 35
— — — — condensata Kem.-Nat. 35
— — — — foliosa Fiori. 35
Solidago *virga aurea* f. genuina Fiori. 35
———— maxima C. Koch. 34
———— obtusisquamea Kem.-Nat. 35
— — — — — subglabra Neum. 41
— — — — α. *vulgaris* Ldb. 36, 42
— — — — β. *lapponica* Wahlb. 41
— — — — γ. *alpestris* Ldb. 39
— — — — γ. *arctica* Hantm. 41
— — — — γ. *multiradiata* Torr. and Gr. ...47
— — — — δ. *lapponica* Ldb. 41
— — — — ε. *arctica* Ldb. 47
— — — — E. *arctica* Herd. 45
— — — — M. *arctia* DC. 47
— — — — *lapponica* C. Rgl. 41
— — — — vulgaris Ldb. 34
— *vulgaris* Mill. 34
Sprunnera Schultz. 432
Spurago spicata Gaertn. 23
Staehelina Sintenisii Bornm. 183
Stenactis Cass. 191, 244
— *annua* Cass. 244
— — Nees. 244
— *pseudo-annuus* Worosch. 245
— *ramosa* Domin. 245
— — Walter ex Rasinis. 245
Stevia Cav. 18
— *hyssopifolia* Sims. 18
— ovata Willd. 18
— paniculata Lag. 18
Stigmophyllum Novopokr., sect. ...143
Stoechas Benth., sect. 409
— *citrina* Jülbenst. 410
Strabonia DC. 487
— *gnaphalodes* DC. 496
Symphyllocarpinae Smoljan., subtrib. 297
Symphyllocarpus Maxim. ...298, 300
— exilis Maxim. 298, 300
Synchaeta Kirp., subgen. 397
— *caucasica* Kirp. 401
— *norvegica* Kirp. 399
— *sylvatica* (L.) Kirp. 398

Tagetes L. 569
— erecta L. 571
— minuta L. 570
— patula L. 571
Tagetininae O. Hoffm., subtrib. 569
Telekia Baumgart. 510
— *cordifolia* DC. 510
— *ovata* C. Koch. 510
— *speciosa* (Schreb.) Baumg. ...443, 510

Tetragonotheca abyssinica Ldb. 545
Thamnoaster Tamamsch., sect. 115
Thyrsiflorae A. Gray, sect. 34
Trimorpha Cass. 191
Trimorpha (Cass.) M. Pop., subgen. ...
....................223, 238, 246, 261, 262
— *acris* S.F. Gray. 246
— alpina S.F. Gray. 252
— — Vierh. 252
— *angulosa* Vierh. 251
— *armerifolia* Virh. 243
628 — *borealis* Vierh. 253
— *elongata* Vierh. 251
— *eriocephala* Novopokr. ex Serg. 265
— *podolica* Vierh. 249
— *polita* Vierh. 251
Trimorphaea Cass. 191
— *caespitans* Kom. 246
— *vulgaris* Cass. 246
Tripolium Nees. 183
— (*Astropolium*) Nutt. 185
— *longicaule* Duf. 184
— *maritimum* Leveillé. 184
— (*Oxytripolium*) DC. 185
— *pannonicum* Schur. 184
— *subulatum* var. *brasilianum* DC. 186
— vulgare Nees. 184
Tubuliflorae DC. 14
Turcxaninowia DC. 136
— fastigiata (Fisch.) DC. 137
Urolepis Boriss., sect. 337

Varthemia DC. 486
— persica DC. 486
Verbesina alba L. 538
— *prostrata* L. 538
Verbesininae O. Hoffm., subtrib. 536

Vicoa Cass. 477
— O. Hoffm., sect. 477
— *Albertoregelia* Winkl. 479
— *divaricata* (Cass.) Benth. and Hook. f. 480
— *glandulifera* Krasch. 485
— *parietariodes* Nevski. 484
— *Pentanema* Aiton and Hemsl. 480
— *rupicola* Krasch. 483
Virgaurea DC., subgen. 33

Wiborgia parviflora H.B. and K. 563

Xanthium L. 521
— californicum Greene. 526
— *medium* Nosat. 523
— occidentale Bertol. 525, 526
— orientale L. 526
— pungens Wallroth. 526
— riparium Itz. and Hertsch. 529
— sibiricum Patrin. 524
— spinosum L. 523
— strumarium L. 521, 524
— — var. *sibiricum* Patrin. 524
Xerotium montanum Bluff. and Fingerhuth. 323
Xylogalatella Novopokr., sect. 163

Zinnia L. 532
— elegans Jacq. 532, 533
— — — var. alba DC. 533
— — — — violacea DC. 533
— Haageana Rgl. 533
— multiflora L. 533
— pauciflora L. 533
Zinninae O. Hoffm., subtrib. 532

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